HP VMA-series Memory Array Installation and Service Guide

Abstract

This document describes the installation and service procedures for the HP VMA-series Memory Array. This document is intended for experienced service technicians. HP assumes that you are qualified in the servicing of computer equipment, are trained in recognizing hazards in products with hazardous energy levels, and are familiar with weight and stability precautions for rack installations.

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Preface

This document describes how to install and service the Memory Array.

- Document Organization on page 17
- Security on page 19
- Document Conventions on page 18
- Reference Documents on page 19
- Contacting HP on page 19

Document Organization

This guide is organized into the following sections:

- PART I: Product Overview
  - Chapter 1, VMA-series Overview—Introduces the Memory Array and its features, components, and specifications.
  - Chapter 2, Violin Intelligent Memory Modules—Describes the VIMM technology including types, configurations, and slot locations.
- PART II: Operation
  - Chapter 3, Installing the Array—Describes how to install the Memory Array.
  - Chapter 4, Configuring the Array—Describes how to perform the initial configuration of the Memory Array.
  - Chapter 5, Operating the System via the CLI—Describes the Memory Array command line interface (CLI) and how to use it.
  - Chapter 6, Servicing the Array—Describes how to safely service the Memory Array including replacing fans, power supplies, and VIMMs.
- PART III: Host Utilities

  - Chapter 7, Linux Drivers—Describes how to install, use, and remove the Linux drivers on a host computer directly attached to the Memory Array.
  - Chapter 8, Windows Drivers—Describes how to install, use, and remove the Windows drivers on a host computer directly attached to the Memory Array.
  - Chapter 9, Violin Utilities—Describes the Memory Array utility commands and how to use them.
  - Chapter 10, Performance Tuning and Troubleshooting—Describes how to perform performance tuning and testing on the Memory Array.
- Appendix A, Product Models—Lists the various Memory Array model configurations.
- Appendix B, Compliance Information—Contains compliance notices and information for the Memory Array.
- Appendix C, Alarm Reference—Describes the various system alarms that may occur when using the Memory Array.
- Appendix D, CLI Reference—Describes the commands available in the Memory Array command line interface.

Document Conventions

Safety Icons

The table below summarizes warning, caution, and note icons used in this document and includes sample text.

Safety Icons

Icon	Sample Text
WARNING!	**WARNING!** Only authorized, qualified, and trained personnel should attempt to work on this equipment.
Caution:	**Caution:** Follow the listed safety precautions when working on the Memory Array.
Note:	**Note:** Read through this entire chapter and plan your installation according to your location before installing the equipment. The following procedures and the order in which they appear are general installation guidelines only.

Typographical Conventions

The table below summarizes the typographical conventions used in this guide.

Typographical Conventions

Format	Meaning
Bold	User Interface text.
Italic	Provides emphasis and identifies variables and document titles.
`Courier`	Command names, examples, and output.
`Courier bold`	Input you must type exactly as shown.
`<Courier italic>`	Information for which you must supply a value.
`[ ]`	Optional command parameters are enclosed within square brackets.
`|`	Separates a set of command choices from which only one may be chosen.
`{ }`	Required command parameters that must be specified are enclosed within curly brackets.

Security

HP cannot be responsible for unauthorized use of equipment and will not make allowance or credit for unauthorized use or access.

Reference Documents

- *vSHARE Memory Gateway Installation and User's Guide*

Contacting HP

For the name of the nearest HP authorized reseller:

See the Contact HP worldwide (in English) webpage (http://welcome.hp.com/country/us/en/wwcontact.html).

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- If you have purchased a Care Pack (service upgrade), call 1-800-633-3600. For more information about Care Packs, refer to the HP website (http://www.hp.com/hps).
- In other locations, see the Contact HP worldwide (in English) webpage (http://welcome.hp.com/country/us/en/wwcontact.html).

For software drivers and firmware downloads:

1. Go to http://www.hp.com/support/downloads.
2. In the Search field on the right-hand side of the page, enter the exact product name.
3. Select your product.
4. Select your operating system or Cross operating system (BIOS, Firmware, Diagnostics, etc.). This takes you to the product download page.
5. Select the appropriate download, and follow the instructions.

PART I

Product Overview

Chapter 1 VMA-series Overview

Chapter 2 Violin Intelligent Memory Modules

CHAPTER 1 VMA-series Overview

This chapter introduces the VMA-series Memory Array, The VMA-series Memory Array is the result of a partnership with Violin Memory, Inc. and is based on the Violin 3000 Series Memory Array. HP and Violin have jointly tested and certified the system with Linux, Windows, and HP-UX servers.

- Features on page 24
- Physical Components on page 24
- Connectivity and Interfaces Overview on page 28
- System Specifications on page 31
- Direct-attached Host Computer Requirements on page 31

Features

The Memory Array:

- Combines standard memory technology and Violin intelligence to create a high-bandwidth, high IOPS, low latency, cost-effective memory array.
- Operates as a direct-attached or SAN-attached (vSHARE) storage system that can be used for swap space, file systems, or exported as raw Logical Unit Numbers (LUNs) or devices. Supports fast random or sequential access operations as there are no mechanical heads to move or spindles to spin.
  - In the base configuration it directly connects via PCI Express (PCIe) to one or two host computers running Windows or Linux, or to a Memory Gateway.
  - Alternatively, it may be connected to a storage area network (SAN) via Fibre Channel or Ethernet (iSCSI).
- Is designed for highly reliable data center operation. The system is built with spare Power Supplies, Fans, and Violin Intelligent Memory Modules (VIMMs).

Physical Components

Chassis

Figure 1.1 illustrates the front view of the Memory Array chassis and Figure 1.2 illustrates the rear view.

Front View

The front panel has the Power and Reset buttons that allow you to start, stop, or reset the Memory Array.

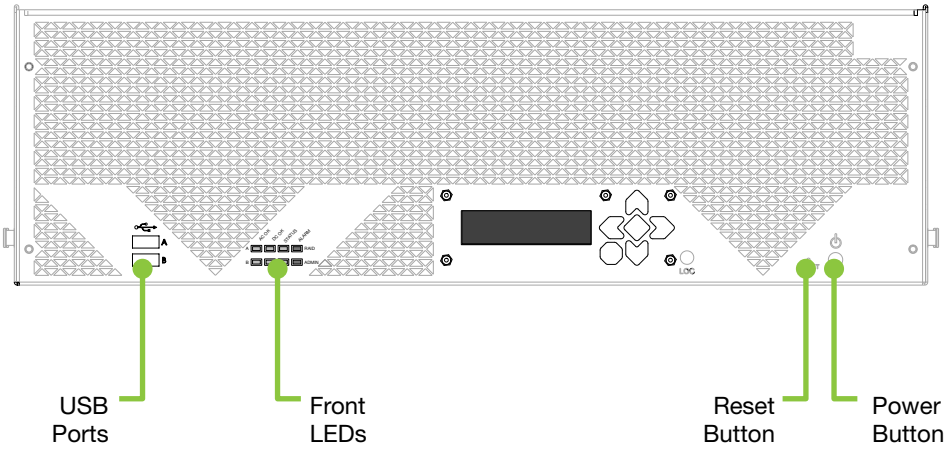


Figure 1.1 Memory Array - Front View

The power button on the front of the array can be used to cause the array to enter into a *shutdown* mode similar to executing the `shutdown` CLI command. With a *shutdown* the media is taken offline and I/O stopped to the connected hosts, but the array is left powered on and able to be managed via the CLI. Use the `reboot` CLI command to bring the array media back online and allow I/O to the connected hosts.

To shut down the system from the front panel, depress the power button for 4 seconds. If the LCD does not indicate the system is shutting down after 10 seconds, depress the power button for another 4 seconds. The LCD should display that the system is shutdown and it is safe to remove the power cords if desired.

Note: The array is not actually powered off when using the power button. Instead the array is logically shut down and the data paths are disabled, placing the array in a safe mode for removing power cords.

Before turning off power to the Memory Array, shut down any direct-attached hosts.

Rear View

The rear panel provides the interfaces for connecting input and output devices, and power supplies. Each interface on the rear of the system has an associated LED and indicates if the interface is in use or not.

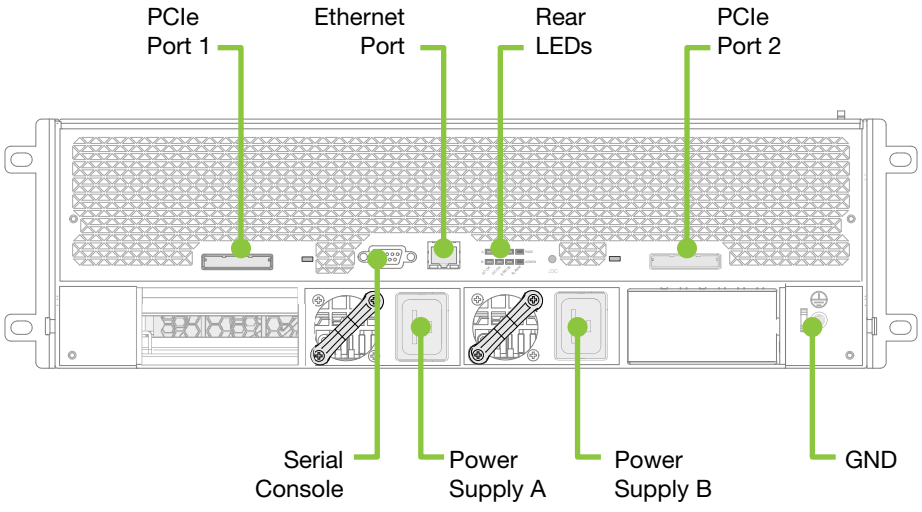


Figure 1.2 Memory Array - Rear View

System LEDs

Eight system LEDs are located on the front of the Memory Array and four system LEDs are on the rear.

Front LEDs

The front LEDs are illustrated in the figure below.

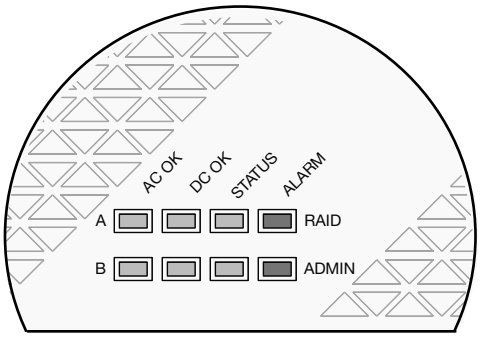


Figure 1.3 Front System Status LEDs

The front LEDs are described in the following table.

Table 1.1 Front LED Descriptions

System	LED Label	Description	Color When Lit
A/B	AC OK	Indicates that the AC power feed to Power Supplies A and B are connected correctly.	Green
	DC OK	Indicates that the DC power feed from Power Supplies A and B are operational.	Green
RAID/ADMIN	Status	Indicates the system status. When lit, the LED could be: • Flashing slowly—Indicates that the system monitor is booting up. • Flashing quickly—Indicates that the system software is booting up, the VIMMs are being detected and programmed, and no RAID groups have been created. • Solid green—Indicates that the VIMMs are programmed, RAID groups are created, and the system software has completed booting.	Green
	Alarm	Indicates a system alarm when lit.	Red

Rear LEDs

The rear LEDs are illustrated in the figure below:

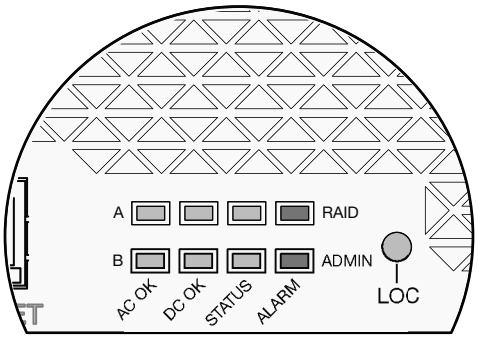


Figure 1.4 Rear System LEDs

The Rear LEDs are described in the following table.

Table 1.2 Rear LED Descriptions

LED Label	Description	Color When Lit
Status	Indicates the system status. When lit, the LED could be: • Flashing slowly—Indicates that the system monitor is booting up. • Flashing quickly—Indicates that the system software is booting up, the VIMMs are being detected and programmed, and no RAID groups have been created. • Solid green—Indicates that the VIMMs are programmed, that the RAID groups are created, and that the system software has completed booting.	Green
Alarm	Indicates a system alarm when lit. When flashing, indicates that the datapath is either severely degraded or is unavailable.	Red
Power A	Indicates that the first power feed is connected correctly.	Green
Power B	Indicates that the second power feed is connected correctly.	Green

Power Supplies

The chassis contains two power supplies that provide an AC power source for the Memory Array. See System Specifications on page 31 for power supply specifications.

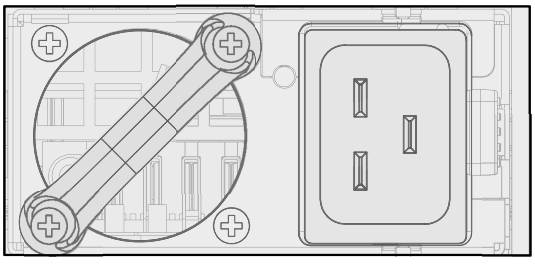


Figure 1.5 Power Supply

The power supplies convert the incoming AC power from individual AC feeds to DC power used by the system. These 1200 W power supplies are redundant in their configuration. The power supplies are hot-swappable at any time. See Connecting the AC Power Cords to the System on page 47 for more information.

The power requirements for the Memory Array are based on the VIMM configuration used.

- 84 VIMM configurations require over 800 W of power and require short term access to 1200 W of power for functions such as formatting. This level of power cannot be supplied through a single 110 V power supply. It is required that each power supply be provided a circuit of over 200 V, with 7 A budgeted.
- 42 VIMM and below configurations require less than 700 W of power. A circuit of over 200 V is recommended, but 110 V may be used.

Fans

Six fans are located in the front of the chassis and provide forced ventilation for the Memory Array. The fans plug into connectors inside the front of the chassis. See Replacing the Fans on page 111 for more information.

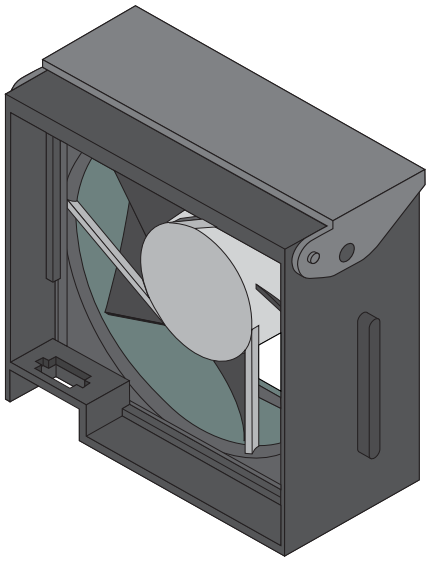


Figure 1.6 Fan Module

Connectivity and Interfaces Overview

The Memory Array contains two types of interfaces:

- Management Interfaces which allow access to the command line interface (CLI) for system configuration.
- Storage Interfaces which allow connection to a host computer or Memory Gateway for data transfer.

Refer to Figure 1.2 for interface locations.

Management Interfaces

Access to the system command line interface (CLI) is available through the following interfaces:

- DB-9 Serial Debug Interface—Opens the CLI on the system.
- Ethernet Interface—Opens the CLI on the system via Telnet or Secure Shell (SSH).

See Connecting the Serial Cable on page 50 and Connecting the Ethernet Cable on page 51 for information.

Storage Interfaces

A single Memory Array may be configured for:

- Direct Attach via PCIe
- SAN attach via Fibre Channel or iSCSI (vSHARE)

Note: System configuration may be changed at any time.

The base platform supports a single PCIe x8 Gen1 (default) interface or dual PCIe x4 Gen2 (option) interfaces that can directly connect to a host computer (via a PCIe driver) or to a Memory Gateway. The optional memory gateways provide specific network interfaces and functions such as SAN block storage or NFS caching.

Note: The VMA-series Memory Array does not currently support dual PCIe connections.

PCIe Direct Attach

PCIe provides the lowest latency and highest bandwidth connectivity to the Memory Array which supports eight lanes of PCIe Gen1 connectivity (20 Gbit/s line rate). The PCIe connection can go to a single host (PCIe x8) for maximum bandwidth or two hosts (PCIe x4 each) for reliability. See Connecting the PCIe Cable to the Memory Array on page 46 for more information.

Where dual PCIe x4 interfaces are required, a special firmware image is loaded onto the Memory Array. Similarly, the Memory Array can be changed back to a single PCIe x8 interface through a new firmware load.

Once a Memory Array is connected to a host computer it can be partitioned into multiple volumes or virtual disks. Both Windows and Linux drivers are supplied for the specific operating system used on the host.

For data transfers, there are two PCIe x8 interface ports on the rear of the Memory Array. These interfaces support either single x8 or dual x4 PCIe connections. The port configuration is determined by the firmware image loaded on the system. See Upgrading the System Software on page 100 for more information on changing the firmware image.

For maximum performance to a single host or single memory gateway, configure the system data interface as a single PCIe x8 connection using Port 1 (see Figure 1.2).

For high-availability connections to two hosts or two memory gateways, configure the system data interface as dual PCIe x4 connections using Ports 1 and 2. This dual configuration allows each host to read and write to the same address space. When two hosts write to the same address, however, no guarantees are made for the order in which the operations are performed; hosts must manage potential conflicts via a clustered file system (e.g., GPFS) or some other technique.

Fibre Channel and iSCSI SAN Attach (vSHARE)

vSHARE provides scale-out block storage (SAN) capability. Memory arrays provide the flash memory storage and Memory Gateways provide the Fibre Channel and/or iSCSI connectivity and LUN management. Clusters of gateways and memory arrays can be built for extremely large-scale block storage systems.

Each Memory Array is managed as a container and multiple LUNs (volumes) are configured on the array. Each LUN can be independently sized and masked for use by different clients and clusters.

The same memory arrays and memory gateways can also be configured to use Ethernet (10GbE). Individual servers may be connected via multiple 1 Gb/s or 10Gb/s links to remove performance bottlenecks and extract the most value out of their processors and DRAM. vSHARE with iSCSI enables 10GbE connectivity between performance servers and performance flash memory arrays.

System Specifications

The table below lists the Memory Array system specifications.

Table 1.3 System Specifications

Specification	Description
Electrical	Input Power Voltage: 120 V or 240 V
	Current Capacity: 12 A @ 120 V or 7 A @ 240 V
Environmental	Ambient Operating Temperature: 5 °C to 35 °C Short Term: -5 °C to 40 °C
	Operating Humidity: 5 to 85% (Non-Condensing) Short Term: 5 to 90% (Non-Condensing)
Interfaces	x8 PCIe Interface (2) **Note:** When both PCIe interfaces are used they become x4.
	Serial Interface via DB-9 male DTE port
	10/100 Ethernet port
Logging	Syslog
Management	CLI: Serial, Telnet, SSH
Physical	Height: 5.19" (3U/132 mm)
	Depth: 28.38" (721mm)
	Width: 16.915" (430mm)
	Minimum Rear Clearance: 7" (178mm)
	Maximum Weight: 76 lbs (34.5 kg)

Direct-attached Host Computer Requirements

The table below lists the minimum requirements for a direct-attached host computer used with the Memory Array.

Table 1.4 Direct-attached Host Computer Requirements

Minimum Requirements
Intel/AMD x86 or x86_64 computer
An available PCIe slot that communicates with the processor. Slots capable of bidirectional x8 PCIe provide the best performance.

Table 1.4 Direct-attached Host Computer Requirements

Minimum Requirements
Supported Operating Systems: • Red Hat Enterprise Linux 5.6 • SUSE Linux Enterprise Server 11 SP1 • Windows Server 2008 R2
Serial communications application, such as vtkermit, tip, minicom, kermit, hyperterm, teraterm, and PuTTY

See Connecting the PCIe Cable to a Host Computer or Memory Gateway on page 53 for more information.

CHAPTER 2 Violin Intelligent Memory Modules

This chapter describes the Violin Intelligent Memory Module (VIMM) technology, types, configurations, and slot locations in the following sections:

- Violin Intelligent Memory Modules (VIMMs) on page 34
- VIMM Types on page 34
- VIMM Configurations on page 35
- VIMM Slot Locations on page 35

Violin Intelligent Memory Modules (VIMMs)

A VIMM, illustrated in Figure 2.1:

- Contains memory and interconnect diagnostics and error correction for data reliability.
- Offers data protection via a flash RAID (4+1Parity) function that provides fault tolerance and low latency access to flash.

A fully populated system contains up to sixteen Parity VIMMs and four spare VIMMs for failure protection. All memory modules are hot swappable with automated rerouting that will not interrupt data service. In the case of a module failure where the module must be replaced, the Memory Array does not have to be powered down.

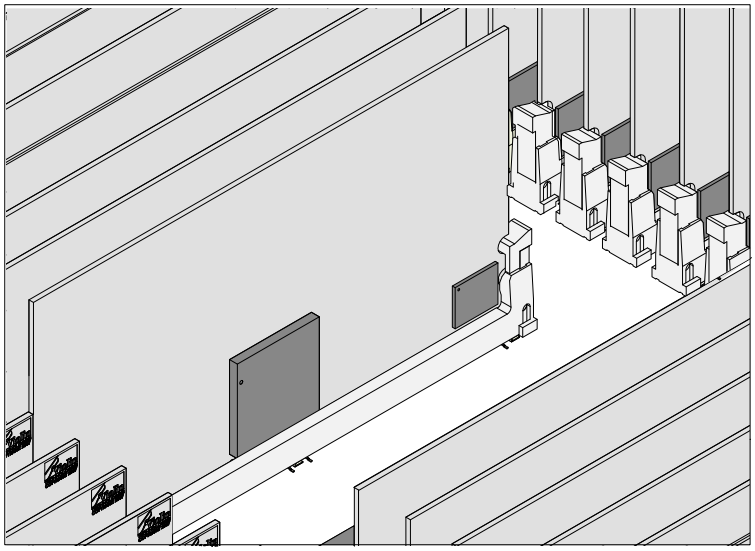


Figure 2.1 VIMMs

WARNING! Insert VIMMs or VIMM blanks only, otherwise permanent system damage will result.

VIMM Types

The Memory Array performance depends on the size of memory used and the number of modules. VIMMs are available in the capacities listed in the following table.

Table 2.1 Available VIMM Types

VIMM Capacity	Raw Memory per Array (84 VIMMs)
128 GB	10.8 TB
256 GB	21.5 TB
512 GB	43 TB

Memory arrays store up to 64, 128, 256, or 512 GB of data per memory module providing up to 43 TB of raw flash storage per system. The amount of usable memory in a system is the number of VIMMs used for data storage, which is four per redundant array of independent disks (RAID) group (up to 64 VIMMs), multiplied by the amount of memory per module, multiplied by the usable percentage the system is formatted for. For example, in a fully loaded system with 84 VIMMs, the usable memory is 64 VIMMs multiplied by 128 GB, multiplied by the usable percentage, such as 87.5%, which is 7.2 TB.

VIMM Configurations

The Memory Array holds up to 84 VIMMs, which operate in the VIMM configurations listed in the following table.

Table 2.2 VIMM Configurations

VIMMs	Active	Spare
84	80	4
42	40	2

VIMM Slot Locations

The Memory Array is available in several VIMM configurations. Table 2.3 lists the VIMM slot numbers used for each configuration. Use the information in the table when adding, removing, or replacing a non-working VIMM to ensure that the VIMMs are still in their correct positions. See Replacing VIMMs on page 113 for information on replacing an errored VIMM.

Table 2.3 VIMM Slot Locations

Number of VIMMs	Slot Numbers
42	3, 4, 5, 6, 7, 8, 12, 13, 14, 15, 16, 17, 18, 22, 23, 24, 25, 26, 27, 35, 38, 39, 40, 41, 42, 43, 44, 45, 48, 60, 64, 65, 66, 67, 68, 69, 71*, 75*, 76, 78, 79, 80 (See Figure 2.2)
84	All slots (0-83)

* Designates a filler slot.

Refer to the following section for a VIMM slot location diagram:

42-Module Configuration

For this configuration VIMMs must be placed in the slot locations illustrated in the following figure.

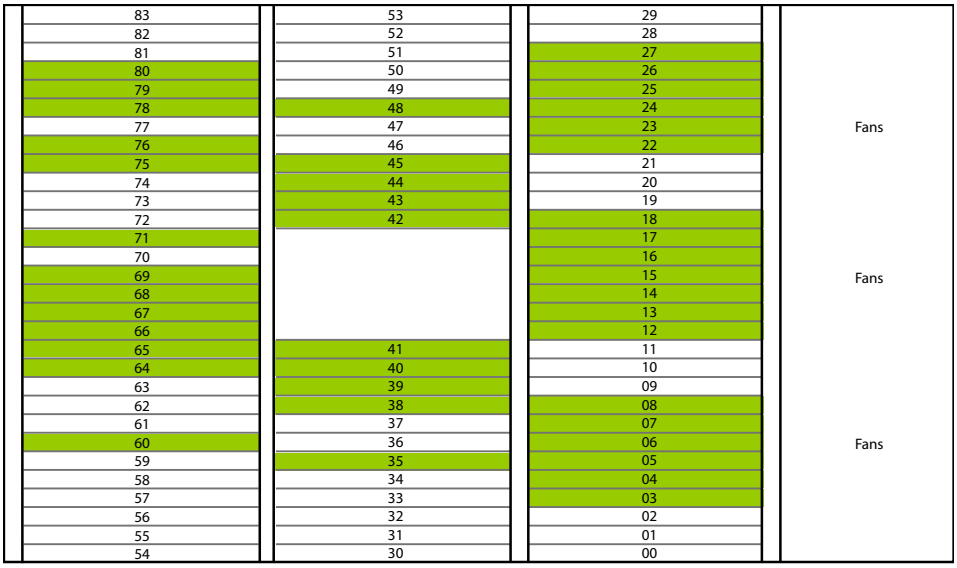


Figure 2.2 VIMM Slot Locations — 42 Modules

All remaining slots must contain blank filler VIMMs. The default spare VIMMs are located at slots 71 and 75.

PART II

Operation

Chapter 3 Installing the Array

Chapter 4 Configuring the Array

Chapter 5 Operating the System via the CLI

Chapter 6 Servicing the Array

CHAPTER 3 Installing the Array

This chapter describes how to install the Memory Array in the following sections.

- Installation and Configuration Overview on page 40
- Rack-Mounting the Chassis on page 42
- Connecting the PCIe Cable to the Memory Array on page 46
- Connecting Power on page 47
- Connecting Management Network on page 50
- Connecting the PCIe Cable to a Host Computer or Memory Gateway on page 53
- Routing the Cables onto the Cable Management Arm on page 55
- Powering up the Memory Array on page 56

Installation and Configuration Overview

Memory Array installation and configuration occurs in five distinct phases:

- Phase 1: Hardware Installation
- Phase 2: Memory Array Configuration
- Phase 3: Storage Configuration
- Phase 4: Performance Testing and Tuning
- Phase 5: Monitoring and Troubleshooting

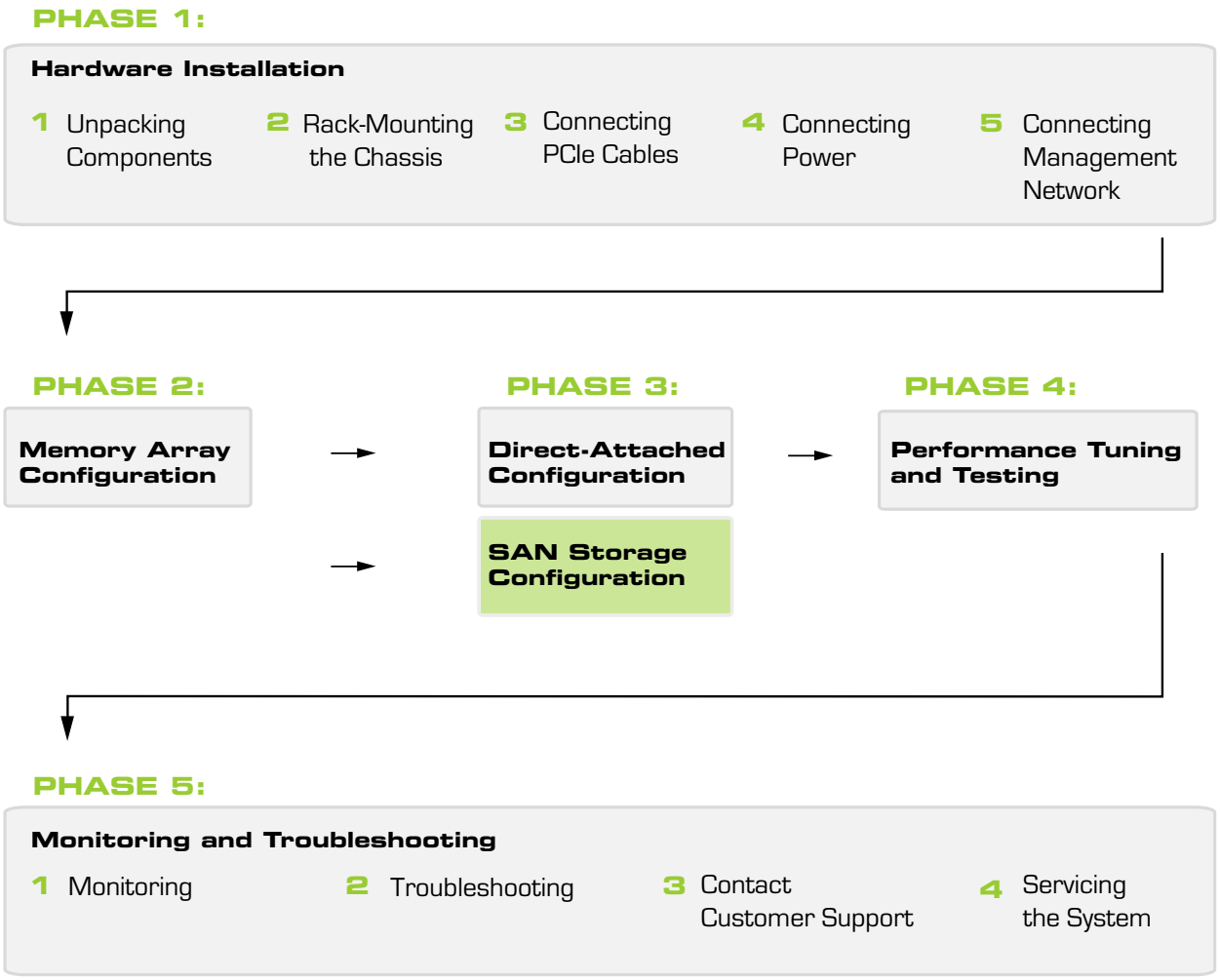


Figure 3.1 Memory Array Configuration Flowchart

The first phase in the flowchart is described in the current chapter. Phase 2, memory array configuration, is described in Chapter 4, Configuring the Array. Phase 3, direct-attach storage configuration, is described in Chapter 7, Linux Drivers and Chapter 8, Windows Drivers for Linux and Windows respectively; for SAN (vSHARE) configuration details refer to the *vSHARE Memory Gateway Installation and User's Guide*. Phase 4, performance testing and tuning, is described in Chapter 10, Performance Tuning and Troubleshooting and

Chapter 9, Violin Utilities. Phase 5, monitoring and troubleshooting is described in Chapter 6, Servicing the Array and Chapter 9, Violin Utilities.

Required Installation Tools and Equipment

The table below lists the tools and equipment required during the installation process.

Table 3.1 Required Installation Tools and Equipment

Item #	Item Description	Quantity
1	Laptop for console access. DB-9 serial connector or USB-to-DB-9 cable/dongle.	1
2	CAT 5 Ethernet Cable with RJ-45 Connectors, straight-through or cross-over, depending on your installation.	1 per array
3	Flat Head Screw Driver, size 1/4"	1
4	Phillips Head Screw Drivers, size 2	1

Rack-Mounting the Chassis

Installing the Memory Array in a 19" Equipment Rack

The Memory Array fits into a standard 19" (482.6 mm) wide, four-post rack with sliding rails as specified by EIA-310-D, IEC 60297, and DIN 41494 SC48D. Square hole racks are supported.

Since there are a variety of 19" equipment racks available, the rack mounting brackets can be configured in several ways to accommodate a range of front-rear post spacings–from 24" to 32". This adapts the slide rails to the various equipment racks that may already exist at a customer's site.

The Memory Array is extended via the slide rails to the front of the rack for live servicing. A cable management arm is used to manage and extend the cables for this process. To ensure there is sufficient room for the cable management arm to easily fit within the rack, it is required that rack depths of 36" or greater be used. Any doors on the rack must allow good front to back airflow.

Caution:

- Improperly spaced mounting brackets and slide rails can cause the Memory Array to fall out of the rack.
- Because of the weight of the Memory Array, two people are required to lift and place the system in an equipment rack.
- If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than the ambient room temperature. Therefore, consider installing the equipment in an environment compatible with the maximum ambient operating temperature specified by the manufacturer.
- Install the equipment in the rack so that the amount of air flow required for safe operation of the equipment is not compromised.
- Mount the equipment in the rack so that a hazardous condition is not achieved due to uneven mechanical loading.

Note: You must be able to access the rear of the Memory Array and the equipment rack during installation.

The following procedure describes how to:

- Install the sliding rails and mounting brackets onto the chassis if they have not been installed prior to shipping.
- Secure the chassis into the equipment rack. The rack mounting screws and nuts are included in the shipping package.

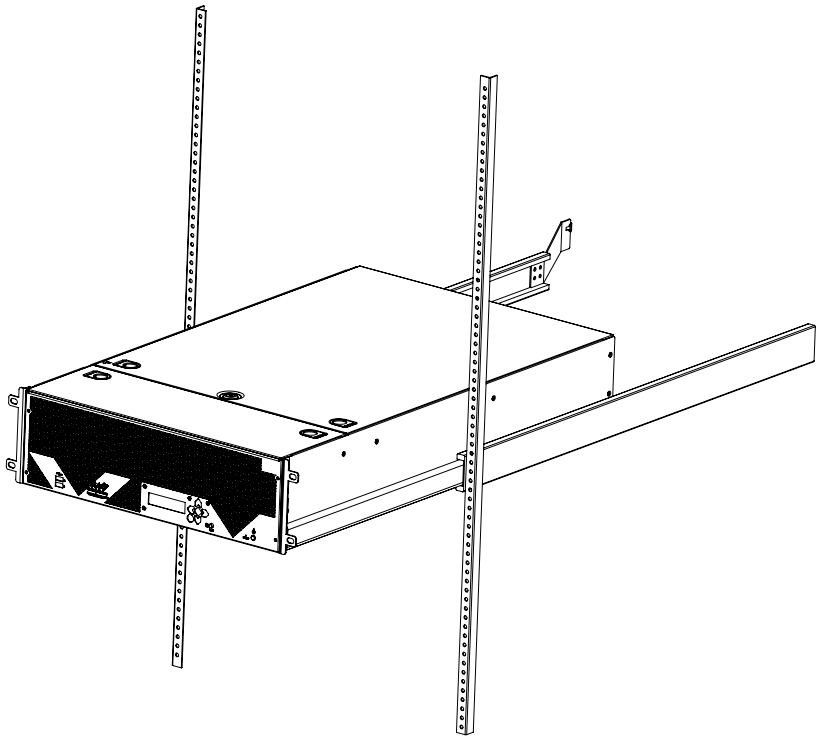


Figure 3.2 Installing the Memory Array into a Rack

To install the Memory Array into a 19" equipment rack:

1. Remove the Memory Array from the shipping packaging and remove all packing materials. Visually inspect the system for any shipping damage and, if any damage is detected, contact HP Customer Support for replacement parts.
2. Install the toolless mounting rails at the appropriate height in your equipment rack. Orient the rails so they slide out to the front of the rack.
3. Fully extend the rails until they lock into place. Position the Memory Array above the rails and slide the buttons at the rear sides of the chassis into the rear slots on the rails.
4. Slip the remaining sets of buttons into the remaining cutouts in the rails. Push the whole assembly back into the equipment rack and secure the rack mounting brackets to the front of the equipment rack with the thumb screws located on the front mounting brackets, as shown in Figure 3.2.

Installing the Cable Management Arm

Install the optional cable management arm at the rear of the chassis. The arm consists of a mounting bracket and cable holder and keeps the cables from becoming entangled when the system is fully extended from the equipment rack. The cables are routed along the length of the arm and held in place with cable ties. The cable management arm is not installed prior to shipping.

To install the cable management arm:

1. At the rear of the chassis, remove the shoulder screws and shims from the rear equipment frame mounting bracket and set aside. Orient the cable management arm mounting bracket on the right, as illustrated in the figure below.

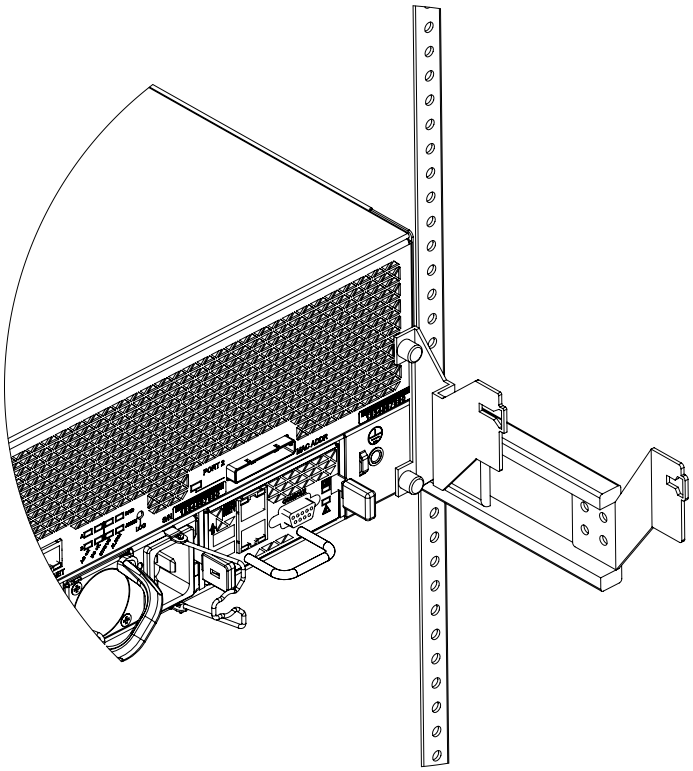


Figure 3.3 Installing the Cable Management Arm Mounting Bracket

2. Align the thumb screws on the cable management arm mounting bracket with the installation holes on the right rear of the chassis. Securely tighten the thumb screws into the chassis.
3. Using the four (4) shoulder screws and shims that were set aside in step 1, secure the cable management arm mounting bracket to the rear equipment frame mounting bracket, placing the shim between the shoulder screws and the cable management arm mounting bracket, with the enclosed Hex key. The cable management arm mounting bracket slides the arm forward and enables the chassis to be fully extended from the equipment rack for accessibility.
4. At the rear side of the system, using the two (2) SEM 10-32 x 0.50 screws included in the shipping package, secure the cable holder to the equipment rack over the rear equipment frame mounting bracket on the right side of the system as illustrated in the figure below.

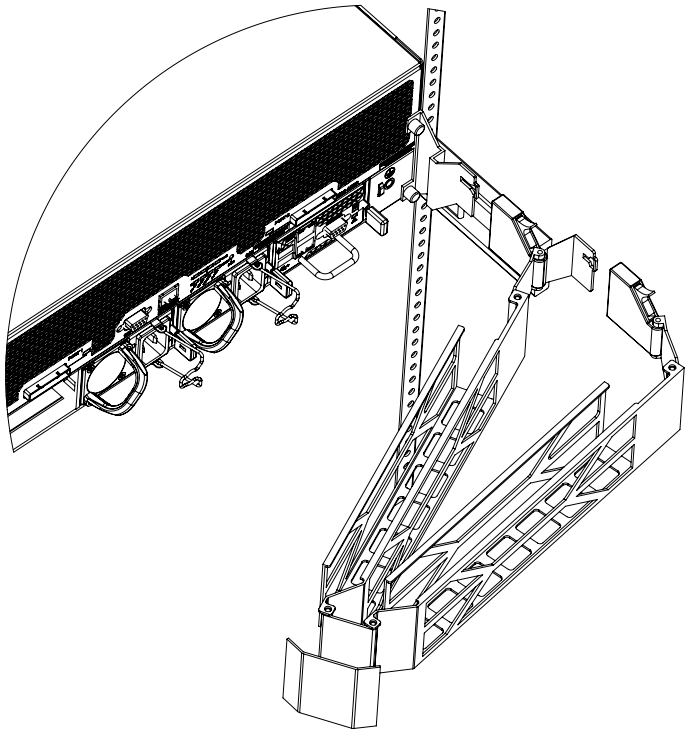


Figure 3.4 Installing the Cable Holder

Connecting the PCIe Cable to the Memory Array

The Memory Array communicates with the host computer via the PCIe (Peripheral Component Interconnect Express) connection. The PCIe cable must be connected to the PCIe port with the flashing LED. The software image on the system dictates which interface port is used. The image names are listed in the table below.

Table 3.2 Image Names

Image Name	PCIe Interface	Interface ID
v3000_Series_x8_p1_df-<*release*>.upg	PCIe x8 Interface for V3000	Port 1
v3000_Series_x4_p1p2_df-<*release*>.upg	Dual PCIe x4 Interfaces for V3000	Ports 1 and 2

Where <*release*> indicates the release number; for example, A3.7.2-18919.

Note: Ensure that the:

- Bend radius of the PCIe cable is greater than 1.9".
- PCIe cable is connected to the port with the flashing LED.

To connect the PCIe cable to the Memory Array PCIe connector:

1. Locate the appropriate PCIe connector port at the rear of the Memory Array. This is indicated by the flashing LED that is associated with the port.

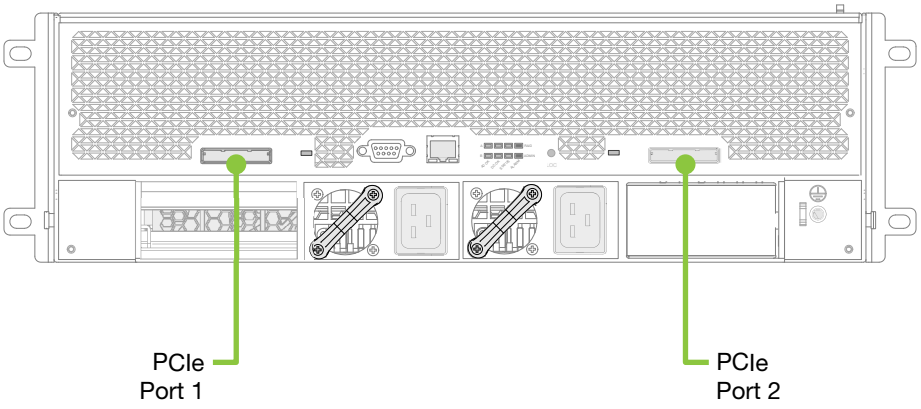


Figure 3.5 Connecting the PCIe Cable to the Memory Array

2. Orient one connector of the PCIe cable so it aligns appropriately with the PCIe connector at the rear of the Memory Array.
3. Securely plug the cable into the PCIe connector port on the Memory Array.
4. If using the cable management arm, route the PCIe cable according to the instructions in Routing the Cables onto the Cable Management Arm on page 55.

Connecting Power

WARNING! Powering down the system processor interrupts traffic and causes loss of system logs and diagnostic data. To preserve this diagnostic data it is recommended that the `vincident` and/or `save log` commands be used prior to powering down the system.

It is recommended to reboot the system rather than powering down then up.

Using a syslog server also ensures logs are stored prior to any reboot or power down. See Displaying and Setting System Log (Syslog) Options on page 71.

Power Requirements

The Memory Array has the following power requirements:

Table 3.3 Power Requirements

Item	Requirement
Voltage Input Range	180 - 264VAC (1200 W) 90 - 264VAC (1000 W)
Frequency	47-63 Hz

Connecting the AC Power Cords to the System

WARNING! Only authorized, qualified, and trained personnel should attempt to work on this equipment. Install the Memory Array with a 50 A maximum branch circuit rating by an end-use application using a UL listed circuit breaker rated at 50 A.

The Memory Array chassis has the AC power supplies installed prior to shipping. Connect the AC power cord to either power receptacle on the Memory Array, or both. Connecting a second power cord is for redundancy purposes.

The power supplies have an IEC-C20 male receptacle and accept an IEC-C19 female connector.

Caution: Consider the equipment connection to the supply circuit and the effect that overloading the circuits might have on overcurrent protection and supply wiring. Also consider the appropriate equipment nameplate ratings when addressing this concern.

Note: The AC power cords are not a standard configuration. Use only the AC power cords supplied with your system.

To connect the AC power cords to the system:

1. Locate the AC power receptacles at the rear of the system, as shown in the figure below.

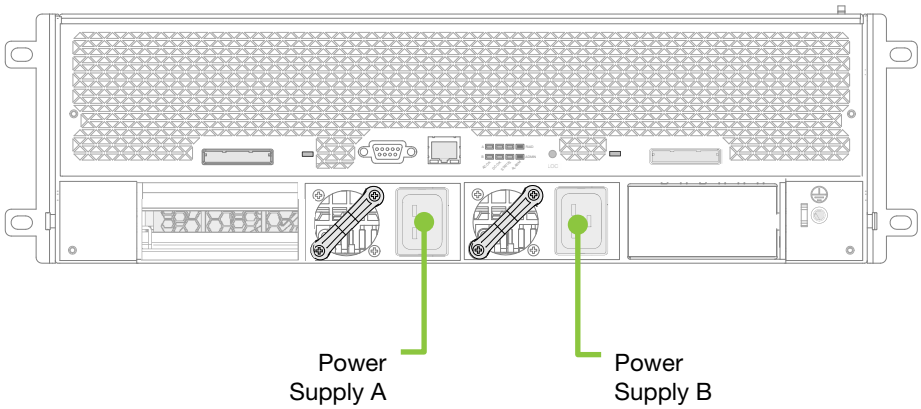


Figure 3.6 AC Power Receptacle Locations

2. Insert the power connector(s) into the mating power receptacle(s) on the rear of the Memory Array.
3. If using the cable management arm, route the power cord(s) according to the instructions in Routing the Cables onto the Cable Management Arm on page 55.

Connecting Equipment Ground

Connect equipment ground from the equipment rack to the Memory Array only after installing the system into the equipment rack.

Note:

- Use appropriately sized wire for your equipment application. Minimum acceptable wire gauge is 8 AWG.
- Maintain reliable earthing of rack-mounted equipment. Supply extra connections other than the direct connections to the branch circuit (e.g., using power strips).

If ground cable included in accessory kit

1. Using the 2.5 m (8.20 ft) ground cable supplied with the array, attach the end of the cable with the lug installed to an appropriate grounding point on the equipment rack. Use an appropriately sized screw to attach the ground lug to the equipment rack.

2. Route the equipment ground cable to the rear of the equipment. Be sure to leave an appropriate service loop to allow the removal of the equipment on the slide rails. If using the cable management arm, route the equipment ground wire around the arm. See Routing the Cables onto the Cable Management Arm on page 55.
3. Cut the length of the ground wire at the rear of the equipment as needed for proper fit. If the length of the cable is cut, strip 13 mm (½ in) of insulation from the cut end of the cable for installation into the grounding lug.
4. Attach the ground cable to the loose grounding lug provided with the Memory Array. Tighten the screw on the lug to secure the cable to the lug.
5. Using the grounding screw provided with the Memory Array, attach the lug to the ground point on the rear of the equipment.

Note: Attach the lug with the cable pointing up. Attaching the lug with the cable pointing down may cause interference between the ground cable and equipment mounted directly below the Memory Array which would prevent the Memory Array from sliding out of the equipment rack for serviceability.

If ground cable not included in accessory kit

When installing a grounding cable, be sure to allow a sufficient service loop to allow the array to be removed from the front of the rack for serviceability.

One end of the grounding cable should be attached to an appropriate ground location on the equipment rack. The other end of the ground cable should be attached to the grounding location on the rear of the Memory Array using a ¼-20 x ½" (max length) size screw.

Connecting Management Network

Connecting the Serial Cable

The serial null modem cable connects the host computer to the system's debugging interface to retrieve system status and troubleshoot system events. The default serial port settings are shown in the following table.

Table 3.4 Default Serial Port Settings

Setting	Value
Speed (baud rate)	9600
Parity	No
# of data bits/character	8
# of stop bits/character	1
Carrier Detect	No
Flow Control	xon/xoff

The serial cable's pinout is described in the following table.

Table 3.5 DB-9 to DB-9 Serial Null Modem Cable Pinout

DB-9 Connector 1		DB-9 Connector 2	
Description	Female Connector	Female Connector	Description
Receive Data	2	3	Transmit Data
Transmit Data	3	2	Receive Data
Data Terminal Ready	4	6+1	Data Set Ready + Carrier Detect
System Ground	5	5	System Ground
Data Set Ready + Carrier Detect	6+1	4	Data Terminal Ready
Request to Send	7	8	Clear to Send
Clear to Send	8	7	Request to Send

To connect the serial cable to the Memory Array and the host computer:

1. Connect one DB-9 female connector on the serial cable to the male DB-9 connector on the rear of the Memory Array, see Figure 3.7. Secure the cable to the chassis by tightening the screws on the DB-9 connector.

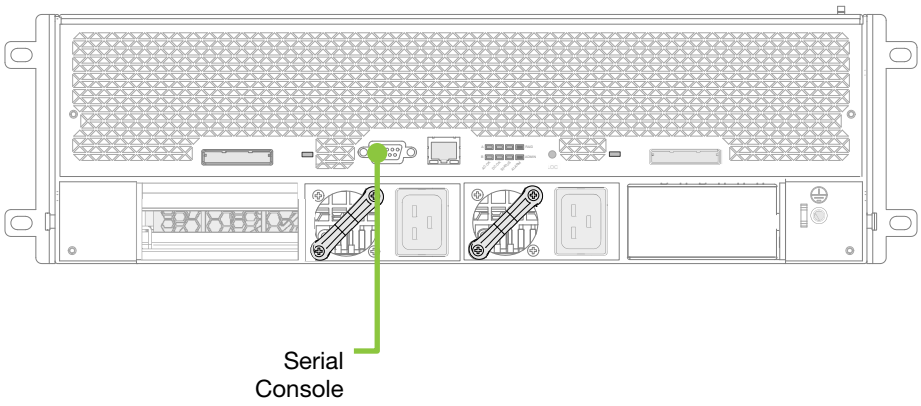


Figure 3.7 Connecting the Serial Cable to the Memory Array

2. If using the cable management arm, route the serial cable according to the instructions in Routing the Cables onto the Cable Management Arm on page 55.

3. At the rear of the host computer, plug the other end of the serial cable into the male DB-9 connector, see Figure 3.8. Secure the connection by tightening the screws on the DB-9 connector.

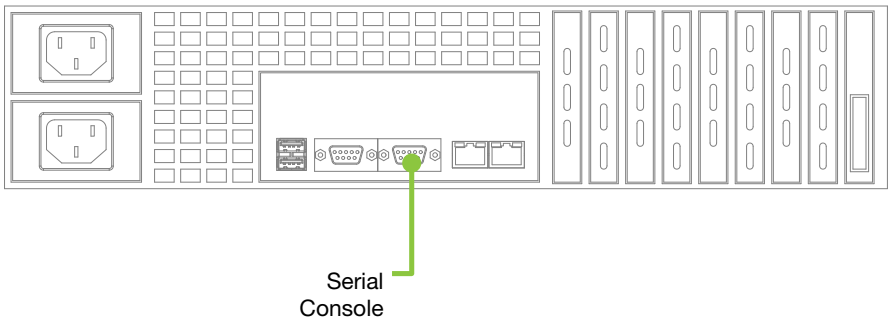


Figure 3.8 Connecting the Serial Cable to the Host Computer

Connecting the Ethernet Cable

The Ethernet cable connects the host computer to the system's command line interface (CLI) for configuration operations and retrieving system status.

For a direct host-to-system Ethernet connection, use a straight-through or cross-over RJ-45 to RJ-45 CAT5 Ethernet cable. You can also use a straight-through or cross-over cable to connect the Memory Array to a router, hub, or other network device, provided that the host and the system can communicate with each other.

To connect the Ethernet cable to the Memory Array and the host computer:

1. Connect one RJ-45 connector on the Ethernet cable to the RJ-45 connector labeled ETHERNET on the rear of the Memory Array, as shown in the figure below.

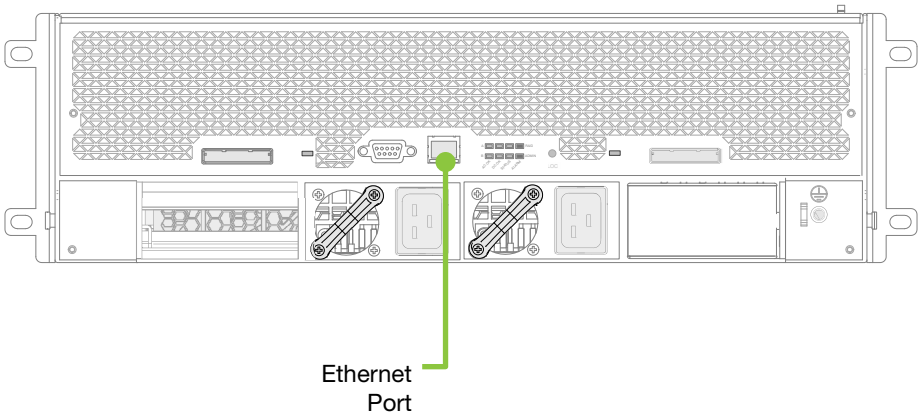


Figure 3.9 Connecting the Ethernet Cable to the Memory Array

2. If using the cable management arm, route the Ethernet cable according to the instructions in Routing the Cables onto the Cable Management Arm on page 55.
3. If directly connecting the Memory Array to a host machine, plug the other end of the cable into the Ethernet connector on the host.
4. If connecting to a network device, such as a router, plug the other end of the cable into the Ethernet connector on the network device. Use a second Ethernet cable to connect the host computer to the network device.

Connecting the PCIe Cable to a Host Computer or Memory Gateway

The Memory Array is connected via external PCIe cables (PCIe x8 cables) to one or two host computer(s) or memory gateway(s). Hosts support applications, such as databases, and run operating systems such as Linux or Windows. Memory gateways provide network connectivity to SANs or LANs.

The Memory Array can be connected as a direct-attached storage system which is either dedicated to a single host or shared between two hosts. Where the Memory Array is shared across two hosts, the PCIe connections are logically PCIe x4, but use PCIe x8 cables and interfaces.

A single host may connect to multiple memory arrays, enabling capacity and performance to scale as needed. The host requires a PCIe Host Interface Board (HIB) for each memory array that is to be connected.

Host Computer

The steps for connecting the Memory Array to a host computer are:

1. Install the necessary PCIe HIB card into an available PCIe slot in the host computer, ensuring that it is securely seated.
2. Orient the unconnected end of the PCIe cable(s) to align with the PCIe connector on the back of the host computer. The PCIe cable is keyed and only goes in one way.
3. Securely plug the cable(s) into the PCIe connector, as illustrated in the figure below.

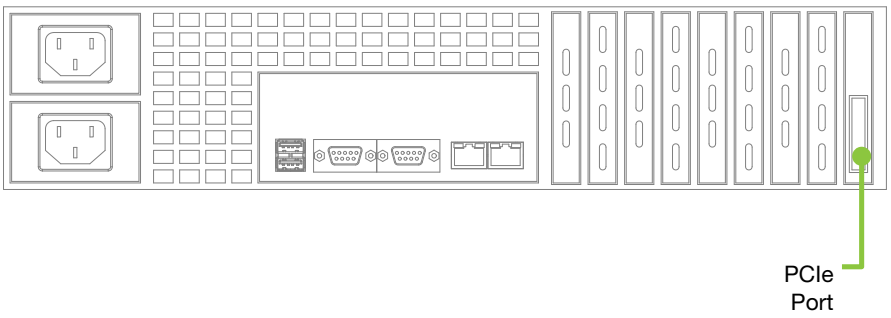


Figure 3.10 Connecting the PCIe Cable to the Host Computer

4. Power-up the Memory Array (see Powering up the Memory Array on page 56). Ensure the RAID/ADMIN Status LED is solid green indicating the PCIe ports have stabilized before continuing (approximately 1 minute).
5. Power-up the host computer.
6. If necessary, install the device drivers (see Chapter 7, Linux Drivers or Chapter 8, Windows Drivers) and reboot the host.
7. Verify the PCIe connection(s).

Memory Gateway

The steps for connecting the Memory Array to a memory gateway are:

1. Orient the unconnected end of the PCIe cable(s) to align with the PCIe connector on the back of the Memory Gateway. The PCIe cable is keyed and only goes in one way.
2. Securely plug the cable(s) into the PCIe connector.
3. Power-up the Memory Array (see Powering up the Memory Array on page 56). Ensure the RAID/ADMIN Status LED is solid green indicating the PCIe ports have stabilized before continuing (approximately 1 minute).
4. Power-up the Memory Gateway.
5. Verify the PCIe connection(s).

Refer to the *vSHARE Memory Gateway Installation and User's Guide* for more information.

Routing the Cables onto the Cable Management Arm

After installing the Memory Array in an equipment rack and attaching the necessary cables at the rear of the system, route the cables along the cable management arm to prevent them from becoming entangled when the system is fully extended from the equipment rack. Route the cables along the length of the arm and hold in place with cable ties.

To route the cables along the cable management arm:

1. Extend the cable management arm by removing the screws from the equipment rack, holding the chassis brackets, and pulling out the Memory Array from the equipment rack. Do not remove the system from the rack.
2. At the rear of the chassis, route the installed ground wire, serial cable, and power cables along the length of the cable management arm and secure them with cable ties. Slip the cable ties around the slits in the arm and secure the ties around the routed cables.
3. Route the PCIe cable along the cable management arm and above the hinge in the middle of the arm. Routing the PCIe cable above the hinge ensures that when the system is in place in the equipment rack, the cable radius stays above the minimum radius for PCIe cables.

   Note: The minimum radius bend for a PCIe cable is 1.9".

4. Push the Memory Array back into the equipment rack and secure it to the equipment frame using the screws that were removed earlier.

Powering up the Memory Array

After connecting the AC power cords to the Memory Array, and connecting the PCIe, Ethernet, and serial cables between the Memory Array and the host computer or memory gateway, apply power to the Memory Array.

To complete the power up sequence:

1. Plug each AC power cord from the chassis into an AC outlet.
2. On the Memory Array, press the power button to start the system boot process. The LEDs will begin to light up.

   Note: Some memory arrays do not have power buttons.

   Note: Power up the Memory Array before the host computer to ensure PCIe communication because PCIe hotplug is not supported by some current BIOS versions. An alternate method is to reboot the host computer after powering up the Memory Array to ensure that the host computer recognizes the system.

3. During the boot up process, the green *Status* and the red *Alarm* LEDs will flash. The Memory Array is fully booted when the *Status* LED is continuously lit.
4. Power up the host computer and log in as **`root`** on a Linux system, or as an "administrator" on a Windows system to install the device driver. See Chapter 7, Linux Drivers, or Chapter 8, Windows Drivers for details. Also, see Chapter 5, Operating the System via the CLI for information on using the command line interface (CLI).

CHAPTER 4 Configuring the Array

When the Memory Array is first powered on, all configuration settings are set to default values. You must change the default settings to communicate with the Memory Array over your network(s). This chapter explains how to log into the Memory Array's command line interface (CLI) to change system settings, such as the hostname, IP address, DNS, and syslog options in the following sections.

- Memory Array Default Settings on page 58
- Connecting to the CLI on page 59
- Changing the Default System Settings on page 62
- Configuring DHCP Settings on page 65
- Configuring Domain Name System (DNS) on page 67
- Verifying the Ethernet Connection on page 70
- Displaying and Setting System Log (Syslog) Options on page 71
- Formatting the Memory Array on page 74

Memory Array Default Settings

The Memory Array has the system default settings listed in Table 4.1. Change these settings using the CLI over a Telnet/SSH session or the serial port on the Memory Array. See Changing the Default System Settings on page 62.

Table 4.1 Memory Array System Default Settings

Setting	Default Value
Host Name	`violin`
IP Address	`192.168.1.2` (static)
IP Netmask	`255.255.255.0`
Gateway	`undefined`
DHCP	`disabled`
User Login Name	`admin`
User Password	`admin`
DNS Config	`manual`
DNS Name Server	`undefined`
DNS Search	`undefined`
Clock Source	`host`
Shell Connectivity	Serial, Telnet (port 23), SSH (port 22)
Serial Port Settings	`9600` Baud, `No` Parity, 8 bits, `1` stop
System Log (syslog)	`disabled`
Message Logging Level	`info`
Command Line Editor	`emacs`
CLI Window Columns	`80`
Usable VIMM Capacity	`65%`

Connecting to the CLI

Logging into the CLI via the Serial Interface

Access the Command Line Interface (CLI) through the serial connection between the host computer and the Memory Array. This connection was set up when the equipment was installed into its permanent location. See Connecting the Serial Cable on page 50.

See Table 3.4 on page 50 for the serial interface default values.

Note: Your settings for the console connection may vary from the listed default settings.

Note: Use a USB-to-serial adapter to plug into the serial port on the back of the Memory Array if your host computer does not have an available serial port.

Logging in via a Windows host computer

The following procedure shows how to connect to the Memory Array using a terminal emulation application. For example, using PuTTY to connect to the CLI through the serial connection:

1. Log into the host computer as an administrator.
2. From the Windows **Start** menu, select **Programs** > **Accessories** > **Communications** > **PuTTY**.

   The *New Connection - PuTTY1* window opens.
3. In the *Connection Description* window:
   a. Type the name of the new connection in the **Name** field.
   b. Select the appropriate icon from the list of available ones.
   c. Click **OK** when done.

   The *Connect To* window opens.
4. In the **Connect using** drop-down list, select **Serial**.
5. Click **Connect**.

   The following login prompt appears:

   ```
   violin login:
   ```
6. Type the default login name (`admin`) and password (`admin`) to log into the system.

   You are now connected to the CLI of the Memory Array and can access the various CLI commands. Closing the PuTTY window terminates the connection.

Logging in to the CLI via a Linux host computer

Connect to the Memory Array using the Kermit application or another terminal application, such as `tip`, if your system does not have Kermit. Save the Kermit parameter settings in a `.kermrc` file so that you do not need to type them each time you connect. The Violin Utilities package for Linux includes Violin's version of Kermit called `vtkermit`.

Note: Place the `.kermrc` file in your home directory so that the Kermit application recognizes it; otherwise, use the `-y` option followed by the location and file name of the configuration file.

To connect to the CLI through the serial connection:

1. Log into the host computer as `root`.
2. At the host computer's command line prompt, type:

```
# kermit
```

or

```
# vtkermit
```

3. Specify the line of the Kermit connection. At the Kermit prompt, type:

```
C-Kermit> set line /dev/ttyS0
```

Note: The device name may vary depending on the host and the Linux operating system that is running on the host.

4. Specify the flow control mode. At the Kermit prompt, type:

```
C-Kermit> set flow xon/xoff
```

5. Specify the speed of the Kermit connection. At the Kermit prompt, type:

```
C-Kermit> set speed 9600
```

6. Since the serial interface of the Memory Array does not require the carrier detect signal on the Kermit connection, at the Kermit prompt, type:

```
C-Kermit> set carrier-watch off
```

7. To establish the connection to the Memory Array, at the Kermit prompt, type:

```
C-Kermit> connect
```

The following login prompt appears:

```
violin login:
```

8. Type the default login name (`admin`) and password (`admin`) to complete logging into the system.

9. At this point, you are connected to the CLI of the Memory Array and can access the various CLI commands. To close the Kermit application, do one of the following:
   a. At the CLI prompt, type **Ctrl-**, **c**, and then **q**.
   b. Close the terminal window, which terminates the Kermit connection.

Changing the Default System Settings

Table 4.1, Memory Array System Default Settings, on page 58 lists the system configuration default values.

When you initially log into the Memory Array through the serial interface, change the following default configuration parameters for security and ease of use.

Table 4.2 Changing the Default System Settings

Setting	Details
Hostname	See Changing the Hostname.
IP address, Gateway address, Netmask	Change the network address information to your customer location scheme to prevent problems connecting to the Memory Array. See Changing the Default IP Address, Netmask, and Gateway on page 63.
Password	See Changing the Admin Password on page 62.

To reset back to the factory default settings, see Restoring the Factory Default Settings on page 103.

Changing the Admin Password

Change the default password for the admin login at any time from the *System* context level. The admin password must:

- Have a length between 6-12 alphanumeric characters. If six characters are used, then mix upper/lower case letters with numbers and/or punctuation.
- Be a combination of upper and lower case letters and numbers.
- Not be similar to a previous password.
- Not be a palindrome.

If you specify an unacceptable password, you will get a message that the password is *too simple*. By increasing the length of the password, you can use all lower case or all upper case characters. In other words, the longer the password, the less complicated it needs to be.

To change the admin password from the default value:

1. Log into the Memory Array.
2. Navigate to the *System* context level. At the root prompt, type:

```
context system
```

3. At the *System* context prompt, type:

```
set admin password
```

You will be prompted to enter a new password. If the new password meets the requirements you will be prompted to enter the same password again. A message appears indicating that the password has been changed.

The command displays information similar to the following if the new password does not meet the requirements.

```
system> set admin password
Changing password for admin
Enter the new password (minimum of 6, maximum of 12 characters)
Please use a combination of upper and lower case letters and num-
bers.
Enter new password:
Bad password: too simple.
passwd: The password for admin is unchanged.
```

The password remains unchanged if the new one does not meet the requirements.

Note: You cannot reset the password back to the default password (`admin`) for the admin user.

4. To commit the changes made to the password, at the *System* context level command prompt, type:

```
save config
```

Changing the Default IP Address, Netmask, and Gateway

The Memory Array supports assigning IP addresses either statically or through DHCP. The IP address, netmask, and gateway are initially set to default values, see Table 4.1. Change these values to valid addresses within your network to access the system CLI.

By default, DHCP is disabled. For convenience, the Ethernet port supports automatic medium-dependent interface crossover (Auto-MDIX). With this, you can connect the Ethernet port on the system to a computer's Ethernet port, such as a laptop, for provisioning before connecting to a network switch.

You can switch between using DHCP and static addressing. When switching from DHCP to static addressing, the Memory Array uses the default address values if new values have not been pre-provisioned in the CLI. Alternatively, an IP address can be assigned while DHCP is enabled and that IP address is used automatically when switching from DHCP to static IP address assignment (i.e., DHCP is disabled).

Note: It is recommended to manually configure the IP address of the Memory Array to use a static IP address in the DHCP configuration file. If the IP address is automatically assigned there is a risk of the system being assigned a different IP address upon reboot.

Note: When you change the IP address of the system, you will be logged off. Log in again using the new IP address.

To change the system's IP address, netmask, and gateway from the default values:

1. Log into the Memory Array.

   Note: Use Kermit or vtkermit, instead of Telnet, to change the IP address in case the IP address is set incorrectly.

2. Navigate to the *Ethernet 0* context level. At the root prompt, type:

   ```
   context chassis controller ethernet 0
   ```

3. At the *Ethernet 0* context prompt, type:

   ```
   set ip-address <ip-address>[:<netmask>:<gateway>]
   ```

   Where:

ip-address	Specifies the new system IP address.
netmask	Specifies the new system netmask.
gateway	Specifies the new system gateway address.

Changing the Hostname

To change the system's hostname from the default value:

1. Log into the Memory Array.
2. Navigate to the system context level. At the root prompt, type:

   ```
   context system
   ```

3. At the system command prompt, type:

   ```
   set name <hostname>
   ```

   Where:

hostname	Specifies the new system hostname.

Note: Depending on your network, you may need to modify the DNS setting to Telnet to the Memory Array via the hostname. Changing the hostname ensures that you are connecting to the intended memory array if there are multiple memory arrays on the network. See Configuring the DNS Name on page 67.

To access the system CLI, specify the new hostname instead of the IP address in the Telnet session.

Configuring DHCP Settings

Configure several DHCP settings and DNS information automatically or manually on the Memory Array.

Displaying DHCP Status

Display whether or not DHCP is being used to automatically set the system's IP address. By default DHCP is disabled.

1. Log into the Memory Array.
2. Navigate to the *Ethernet 0* context level. At the root prompt, type:

```
context chassis controller ethernet 0
```

3. At the *Ethernet 0* context prompt, type:

```
show
```

When viewing DHCP status, information similar to the following displays:

```
chassis controller ethernet 0> show

dhcp                 disabled
ip-address           192.168.1.7
netmask              255.255.255.0
gateway              192.168.1.1
mac-address          00:1B:97:00:00:05
dns-config           manual
dns-nameserver       undefined
dns-search           undefined
```

Enabling DHCP

Enable DHCP to automatically set the Memory Array's IP address.

1. Log into the Memory Array.
2. Navigate to the *Ethernet 0* context level. At the root prompt, type:

```
context chassis controller ethernet 0
```

3. At the *Ethernet 0* context prompt, type:

```
set dhcp enabled
```

4. To commit the changes made to DHCP, at the *System* context level command prompt, type:

```
save config
```

Disabling DHCP

Disable DHCP to manually set the Memory Array's IP address. This is the system default setting.

1. Log into the Memory Array.
2. Navigate to the *Ethernet 0* context level. At the root prompt, type:

```
context chassis controller ethernet 0
```

3. At the *Ethernet 0* context prompt, type:

```
set dhcp disabled
```

4. To commit the changes made to DHCP, at the *System* context level command prompt, type:

```
save config
```

If DHCP is disabled, you must manually configure the system's IP address. See Changing the Default IP Address, Netmask, and Gateway on page 63.

Once you have manually configured the IP address while DHCP is disabled, you will see that the manually provisioned IP addresses takes effect.

```
chassis controller ethernet 0> show

dhcp                 disabled
ip-address           10.10.0.125
netmask              255.255.255.0
gateway              10.10.0.1
mac-address          00:1B:97:00:00:05
dns-config           manual
dns-nameserver       undefined
dns-search           undefined
```

Configuring Domain Name System (DNS)

There are two available methods for configuring DNS on the Memory Array:

1. Automatic DNS configuration
2. Manual DNS configuration

The Memory Array also allows pre-provisioning the DNS information to use when you change your system from automatic DNS configuration to manual. If the DNS configuration is currently in automatic mode, then the current automatically provisioned DNS name and search information is considered to be the provisioned settings used when the mode is set to manual.

By default, DNS configuration is performed automatically when Dynamic Host Configuration Protocol (DHCP) is enabled and connected to a DHCP server that supports specifying the DNS name. If DHCP is disabled, then the DNS mode is automatically changed to manual.

Note: Pre-provision the DNS configuration information before disabling DHCP. Disabling DHCP forces the DNS mode to change to manual and use the default values, making the system unreachable.

Configuring the DNS Name

When in automatic DNS mode and you set the IP address of the DNS name server, you are pre-provisioning the value. It is not used until you change the DNS mode to manual. You can configure the DNS name server's IP address at any time.

To specify the IP address of the DNS name server of the Memory Array:

1. Log into the CLI via a serial connection or the Ethernet interface (see Connecting to the CLI on page 59).
2. Navigate to the *Ethernet 0* context level. At the root prompt, type:

```
context chassis controller ethernet 0
```

3. At the *Ethernet 0* context prompt, type:

```
set dns-nameserver <ipaddr>
```

Where:

ipaddr Specifies the IP address of the DNS server.

Configuring the DNS Search Domain Name

When in automatic DNS mode and you set the DNS search domain name, you are pre-provisioning the value. It is not used until you change the DNS mode to manual. You can configure the DNS search domain name at any time.

To specify the search domain name of the Memory Array:

1. Log into the CLI via a serial connection or the Ethernet interface (see Connecting to the CLI on page 59).
2. Navigate to the *Ethernet 0* context level. At the root prompt, type:

```
context chassis controller ethernet 0
```

3. At the *Ethernet 0* context prompt, type:

```
set dns-search <value>
```

Where:

value Specifies the search domain name.

In the following example, the DNS name server IP address and the DNS search domain values have been pre-provisioned.

```
chassis controller ethernet 0> show

dhcp                 enabled
ip-address           10.10.0.126
netmask              255.255.255.0
gateway              10.10.0.1
mac-address          00:1B:97:00:00:06
dns-config           automatic
dns-nameserver       10.10.0.2
dns-search           violintech.net
   prov-dns-nameserver 10.10.0.55
   prov-dns-search      hi-octane-prod.net
```

Displaying the DNS Mode and Pre-provisioned Information

To display the current DNS mode and various pre-provisioned DNS information on the Memory Array:

1. Log into the CLI via a serial connection or the Ethernet interface (see Connecting to the CLI on page 59).
2. Navigate to the *Ethernet 0* context level. At the root prompt, type:

```
context chassis controller ethernet 0
```

3. At the *Ethernet 0* context prompt, type:

```
show
```

If DNS is currently in automatic mode, then the status for *dns-config* displays `automatic`. In the following example, the DNS name server IP address and the DNS search domain values have been pre-provisioned.

```
chassis controller ethernet 0> show

dhcp                enabled
ip-address          10.10.0.126
netmask             255.255.255.0
gateway             10.10.0.1
mac-address         00:1B:97:00:00:06
dns-config          automatic
dns-nameserver      10.10.0.2
dns-search          violintech.net
   prov-dns-nameserver 10.10.0.55
   prov-dns-search     violintech-prod.net
```

For information on clearing the provisioned DNS settings see Clearing Provisioned DNS Information on page 89.

Setting the DNS Mode

To set the DNS mode on the Memory Array:

1. Log into the CLI via a serial connection or the Ethernet interface (see Connecting to the CLI on page 59).
2. Navigate to the *Ethernet 0* context level. At the root prompt, type:

```
context chassis controller ethernet 0
```

3. At the *Ethernet 0* context prompt, type:

```
set dns-config { manual | auto }
```

Where:

`manual`	Sets the DNS mode to manual.
`auto`	Sets the DNS mode to automatic.

You can pre-provision the IP address of the name server and the search domain name while the DNS mode is set to automatic. See Configuring the DNS Name on page 67 and Configuring the DNS Search Domain Name on page 68. Change the DNS mode to manual to use the pre-provisioned values.

Verifying the Ethernet Connection

The Ethernet interface can also be used to connect to the CLI of the Memory Array. This section explains how to verify that the Ethernet connection is operating properly.

To verify the Ethernet connection:

1. Log in to the host computer, as `root` on a Linux host or as an administrator on a Windows host.
2. To retrieve the IP address of the Memory Array, do one of the following:
   a. Log into the CLI via the serial port connection (see Logging into the CLI via the Serial Interface on page 59) and type the following command at the command prompt:

      ```
      show chassis controller ethernet 0
      ```

      This command returns the system's IP address and other Ethernet settings.

   b. Connect to your DHCP server and retrieve the IP address it assigned to your Memory Array.
3. Open a terminal or command line window and, at the command prompt, type:

   ```
   $ ping {<memory-array_ip_address> | <memory-array_name>}
   ```

   Where:

memory-array_ip_address	The IP address assigned to the Memory Array.
memory-array_name	The name of the Memory Array if using DHCP and the memory array is registered in the DNS.

   If the host computer can connect to the Memory Array, then it will return a successful ping message. If it cannot connect, then a failed ping message is returned.

You can also connect to the system via the Ethernet port using Telnet or SSH as described in Connecting to the CLI on page 76. If you are using DHCP and DNS, you can use the system's name instead of the IP address to connect through the network.

Displaying and Setting System Log (Syslog) Options

The Memory Array logs system messages that can be sent to a host running a syslog server for long term storage. If numerous messages are generated, then the log buffer may fill up and, since it is a circular buffer, overwrite older messages. The message level mapping between the message level definitions and your host's syslog message level definitions are listed in Table 4.3. View the man page for `syslog.conf` on the host for more information.

Table 4.3 Syslog Definition Mappings

Memory Array	Syslog
DEBUG	debug
INFO	info
WARNING	warn
ERROR	emerg
FATAL	emerg

When syslog messages are received on the host, they are written to whatever logging device is configured. Frequently, this means that `warn` messages are written to a file, such as `/var/log/messages` or `/var/adm/messages`, and `emerg` level messages are written to all root consoles. On the Memory Array, messages that are set to the WARNING, ERROR, or FATAL level are sent to the host.

Displaying the Configured IP Address of the Syslog Host

To display the IP address of the syslog host to which the system log messages will be sent:

1. Log into the Memory Array.
2. Navigate to the *Syslog* context level. At the root prompt, type:

```
context system logging syslog
```

3. At the *Syslog* context prompt, type:

```
show host
```

The command displays information similar to the following:.

```
system logging syslog> show host

host            192.37.87.4
```

Setting the IP Address for the Syslog Host

Send system log messages to a host attached to the Memory Array via the Ethernet port. This host must have syslog configured correctly. See your host's syslog documentation for instructions.

Note: From the CLI prompt, use the `ping` command to verify the connection between the Memory Array and the remote syslog host.

To set the IP address of the host to which the system log messages will be sent:

1. Log into the Memory Array.
2. Navigate to the *Syslog* context level. At the root prompt, type:

```
context system logging syslog
```

3. At the *Syslog* context prompt, type:

```
set host <ip_address>
```

Where:

ip_address	Specifies the IP address of the syslog host to which the system log messages will be sent.

4. To commit the change made to the IP address, from the *System* context level command prompt, type:

```
save config
```

Or, from the *Syslog* context level, type:

```
top
save config
```

Or

```
save system config
```

Determining the Status of the System Log Service

Display the status of the service that sends the system log messages to a host.

1. Log into the Memory Array.
2. Navigate to the *Syslog* context level. At the root prompt, type:

```
context system logging syslog
```

3. At the *Syslog* context prompt, type:

```
show service
```

The command displays information similar to the following:

```
system logging syslog> show service

service            on
```

Sending the System Log to a Host

Start or stop the service to send the system log messages to a host. By default, it is off.

To set the status of the system log service:

1. Log into the Memory Array.
2. Navigate to the *Syslog* context level. At the root prompt, type:

   ```
   context system logging syslog
   ```

3. At the *Syslog* context prompt, type:

   ```
   set service {on | off}
   ```

   Where:

`on`	Starts the service that sends the system log messages to the syslog host.
`off`	Stops the service that sends the system log messages to the syslog host.

4. To commit the change made, from the *System* context level command prompt, type:

   ```
   save config
   ```

   Or, from the *Syslog* context level, type:

   ```
   top
   save config
   ```

   Or:

   ```
   save system config
   ```

Formatting the Memory Array

Note: The array is formatted to 65% usable capacity at the factory and can be used without change.

To change the format of the Memory Array:

1. Log into the Memory Array.
2. At the root CLI prompt, type:

```
format flash-capacity [<value>]
```

Where:

value Specifies the percentage of usable flash capacity. Valid values are:
- 50
- 65
- 78
- 84
- 87
- 90 — Not recommended for high performance or high reliability systems.

Default is 65%.

Higher usable percentages provide more usable capacity where needed. Lower usable percentages increase system write performance, endurance, and reliability. For advice on selecting a good usable percentage, consult with HP Customer Support.

CHAPTER 5 Operating the System via the CLI

The CLI resides on the Memory Array and is used to retrieve system status and set configuration information. This chapter describes how to use the CLI to perform various procedures in the following sections:

- Connecting to the CLI on page 76
- Displaying and Setting the CLI Window Options on page 79
- Displaying and Setting System Information on page 83
- Displaying and Setting Hardware Information on page 92
- Displaying Alarms and Logs on page 96
- Rebooting the Memory Array on page 98
- Upgrading the System Software on page 100

See Appendix D, CLI Reference for details on using the CLI commands.

Connecting to the CLI

Connect to the Memory Array's CLI via SSH or Telnet on the host computer over the Ethernet interface.

You can also log into the system via the serial port. See Logging into the CLI via the Serial Interface on page 59 for instructions.

To connect to the Memory Array from a Windows machine, see Logging in via a Windows host computer on page 59.

Note: The default command line editor for the admin user is *Emacs*. You can change the default editor to *vi*, see Setting the Command Line Editor on page 80.

Connecting via SSH

Connect to the CLI via SSH through your host computer.

On a Linux host, use your preferred command shell. On a Windows host, use a GUI application, such as PuTTY, to SSH to the Memory Array.

The following is an example of what you will see after successfully connecting to the CLI.

```
  ************************************************************************
  *                              OAM-CLI                                 *
  *                                                                      *
  *   Operations, Administration & Maintenance - Command Line Interface  *
  *                                                                      *
  *   Copyright (c) 2006-2010, Violin Memory, Inc.  All Rights Reserved. *
  *                                                                      *
  *                S/W Build Info: Date 17:15:13                         *
  *               swbuild.violintech.net by user common                  *
  *                                                                      *
  *                       Release = Release 3.4                         *
  *                                                                      *
  ************************************************************************
You are at the root node.

>
```

Connecting via Telnet

Connect to the CLI via a Telnet session on your host computer.

Note: To connect to the Memory Array from a Windows machine, see Logging in via a Windows host computer on page 59.

To connect to the Memory Array from a Linux desktop:

1. Right-click on the desktop and select **Open Terminal**. At the command prompt in the terminal window, type:

   ```
   telnet <ip_address>
   ```

   Where:

ip_address	Specifies the IP address of the Memory Array.

2. At the login prompt, type the user login name (default is `admin`).
3. At the password prompt, type the user password (default is `admin`).
4. The following is an example of what you will see after successfully connecting to the CLI.

```
[root@lab5 ~]# telnet 10.10.20.4
Trying 10.10.20.4...
Connected to 10.10.20.4.
Escape character is '^]'.
violin login: admin
Password:
                                .....
                             .....
                          .....
                       .....
                    ..... ~
                 .....     ~
              .....        ~
           .....         ~
        .....          ~
      .....         ~ ~ ~
   .....          ~  ___  ___
.....              ~  ||  //  o         /  o
..                  ~    || //     .--.   /     /_-_
                     ~     ||//  /  /   /  /  /  /   /
                   ~       ||/  /  /___/  /  /  /   /
              ~  ___  ___
~        ~      //|  //|
    ~           //|| //||   .--. /_ _  .--.  /.-- .  .
              // ||// ||  /__/ / / / /   / /    /  /
             //  ||/  || /__  / / / /___/ /    /__/
                                              /
http://www.violin-memory.com/                .__/

  ************************************************************************
  *                               OAM-CLI                                *
  *                                                                      *
  *   Operations, Administration & Maintenance - Command Line Interface  *
  *                                                                      *
  *   Copyright (c) 2006-2010, Violin Memory, Inc.  All Rights Reserved. *
  *                                                                      *
  *                S/W Build Info: Date 17:15:13                         *
  *               swbuild.violintech.net by user common                  *
  *                                                                      *
  *                           Release = R3.4                             *
  *                                                                      *
  ************************************************************************
You are at the root node.
>
```

Displaying and Setting the CLI Window Options

The settings for the terminal window displaying the current CLI session can be modified to suit your display equipment. You can set or retrieve the following window display options:

- Number of columns and lines in the display window
- Pagination
- Command line editing mode
- Size of the history buffer

Displaying the Number of Columns

To view the number of columns in the current CLI display window:

1. Log into the Memory Array.
2. Navigate to the *CL/* context level. At the root prompt, type:

```
context cli
```

3. At the *CL/* context prompt, type:

```
show columns
```

The command displays information similar to the following:

```
cli> show columns

Current column setting is: 200
```

Setting the Number of Columns

Set the number of columns in the display window using the `set columns` command. Set the number of columns in the range of 80-200 inclusively, with the default setting of 80. This determines where the display lines are automatically wrapped to the next line if you find that your terminal settings are not wrapping lines correctly.

To set the number of columns in the display window:

1. Log into the Memory Array.
2. Navigate to the *CL/* context level. At the root prompt, type:

```
context cli
```

3. At the *CL/* context prompt, type:

```
set columns {80-200}
```

Displaying the Command Line Edit Mode

1. Log into the Memory Array.
2. Navigate to the *CL*/ context level. At the root prompt, type:

```
context cli
```

3. At the *CL*/ context prompt, type:

```
show edit-mode
```

The command displays information similar to the following:.

```
cli> show edit-mode

Current edit-mode setting is: emacs
```

Setting the Command Line Editor

Set the command line editor to either *Emacs* or *vi* for the current CLI session. The default editing mode is *Emacs*.

1. Log into the Memory Array.
2. Navigate to the *CL*/ context level. At the root prompt, type:

```
context cli
```

3. At the *CL*/ context prompt, type:

```
set edit-mode {vi | emacs}
```

Where:

`vi`	Sets the command line editor for the current CLI session to *vi*.
`emacs`	Sets the command line editor for the current CLI session to *Emacs*. This is the default.

Displaying the History Buffer Size

1. Log into the Memory Array.
2. Navigate to the *CL*/ context level. At the root prompt, type:

```
context cli
```

3. At the *CL*/ context prompt, type:

```
show history-size
```

The command displays information similar to the following:

```
cli> show history-size

Current history-size setting is: 100
```

Setting the History Buffer Size

Modify the size of the history buffer to hold from 10-1000 lines.

To modify the number of lines in the history buffer:

1. Log into the Memory Array.
2. Navigate to the *CLI* context level. At the root prompt, type:

```
context cli
```

3. At the *CLI* context prompt, type:

```
set history-size {10-1000}
```

Displaying the Number of Window Lines

This command is used by the paginator feature to scroll within large amounts of displayed data, such as when the log is viewed.

1. Log into the Memory Array.
2. Navigate to the *CLI* context level. At the root prompt, type:

```
context cli
```

3. At the *CLI* context prompt, type:

```
show lines
```

The command displays information similar to the following:

```
cli> show lines

Current row setting is: 24
```

Setting the Number of Window Lines

1. Log into the Memory Array.
2. Navigate to the *CLI* context level. At the root prompt, type:

```
context cli
```

3. At the *CLI* context prompt, type:

```
set lines {10-100}
```

Displaying the Pagination Mode

To view whether pagination is enabled or disabled in the current CLI window:

1. Log into the Memory Array.
2. Navigate to the *CL/* context level. At the root prompt, type:

```
context cli
```

3. At the *CL/* context prompt, type:

```
show pagination
```

The command displays information similar to the following:.

```
cli> show pagination

Current pagination setting is: on
```

Setting the Pagination Mode

Enable or disable pagination in the CLI window. When pagination is disabled, data displays on screen without pausing.

To enable or disable pagination in the CLI window:

1. Log into the Memory Array.
2. Navigate to the *CL/* context level. At the root prompt, type:

```
context cli
```

3. At the *CL/* context prompt, type:

```
set pagination {on | off}
```

Where:

`on`	Enables pagination in the current CLI window.
`off`	Disables pagination in the current CLI window.

Displaying and Setting System Information

You can display and set various system information such as the system date and time, system operational time, the system's IP address, the log, spare VIMM information, and RAID group mapping. The following sections describe how to display and set this information.

Displaying System Status Information

Display the status of the various software modules and the validity of the current VIMM configuration.

1. Log into the Memory Array.
2. Navigate to the *System* context level. At the root prompt, type:

```
context system
```

3. At the *System* context prompt, type:

```
show status
```

By default, the display paginates. The example below shows representative text that may be displayed. Actual text that is displayed is determined by your system's configuration.

```
system> show status

alarm-mgr            running
data-mgr             running
diagnostics-mgr      running
hardware-mgr         running
inventory-mgr        running
raid-mgr             running
vimm-mon             running
data-plane           available
raid-rebuild         active (group 2, vimm 07, 47% complete)
vimm-config          out-of-spec-42-vimm
failed-vimm-ids      32, 61
admin-down-vimm-ids  60
missing-vimm-ids     15
host-interfaces
    slot                 port-1
    state                enabled
    protocol             pcie
    link-width           4
    neg-link-width       4
    max-data-rate        10 Gb/s
    cfg-data-rate        10 Gb/s
    host                 detected
```

```
slot                 port-2
   state                enabled
   protocol             pcie
   link-width           4
   neg-link-width       4
   max-data-rate        10 Gb/s
   cfg-data-rate        10 Gb/s
   host                 detected

   slot                 port-0
   state                disabled
   host                 undetected
```

If the VIMM configuration is invalid, or the system is rebuilding the RAID groups, then up to two extra lines are displayed that list:

- ID numbers of the affected VIMMs
- When the RAID group rebuild is active
- Affected RAID group and VIMM

Displaying the System Operational Time

Display how long a system has been operational since the last time it was rebooted (i.e., uptime). The time is displayed in tenths of a second and in year, day, *HH:MM:SS* format.

To display how long the system has been operational:

1. Log into the Memory Array.
2. Navigate to the *System* context level. At the root prompt, type:

   ```
   context system
   ```

3. At the *System* context prompt, type:

   ```
   show uptime
   ```

   The command displays information similar to the following:.

```
system> show uptime

tenths-second        132712724
time                 0 years, 153 days, 14:27:52
```

Where:

`tenths-second`	Displays how long, in tenths of a second, the system has been operational since the last power cycle or system reboot.

`time`	Displays how long the system has been operational since the last power cycle or system reboot in year, day, hour formats.

Displaying the System Date and Time

1. Log into the Memory Array.
2. Navigate to the *System* context level. At the root prompt, type:

```
context system
```

3. At the *System* context prompt, type:

```
show clock
```

The command displays information similar to the following:.

```
system> show clock

clock 2009-07-04T15:39:27
```

Where:

`clock`	Displays the date and time in the format *yyyy-mm-dd*T*hh:mm:ss*. The T is a delineator between the date and the time.

Setting the System Date and Time

1. Log into the Memory Array.
2. Navigate to the *System* context level. At the root prompt, type:

```
context system
```

3. At the *System* context prompt, type:

```
set clock <yyyy-mm-dd>T<hh:mm:ss>
```

Where:

yyyy-mm-dd	Sets the date in the format: • *yyyy* - The 4-digit year. • *mm* - The 2-digit month. Valid values are 01 to 12. • *dd* - The 2-digit day. Valid values are 01 to 31.
T	The delineator between the date and the time.
hh:mm:ss	Sets the time in the format: • *hh* - The 2 digit hour. Valid values are 00 to 23. • *mm* - The 2-digit minutes. Valid values are 00 to 59. • *ss* - The 2-digit seconds. Valid values are 00 to 59.

Displaying the System Clock Source

The clock source can be the host computer or the Memory Array.

1. Log into the Memory Array.
2. Navigate to the *System* context level. At the root prompt, type:

```
context system
```

3. At the *System* context prompt, type:

```
show clock-source
```

The command displays information similar to the following:.

```
system> show clock-source

clock-source         host
```

Setting the System Clock Source

The clock source can be set to the host computer or the Memory Array. The clock on the system only keeps a running count of the number of seconds that the system has been operational. It does not keep an accurate calendar date and time. If the system is rebooted, then the elapsed time is not accounted for when the system finishes the reboot process and is again operational.

1. Log into the Memory Array.
2. Navigate to the *System* context level. At the root prompt, type:

```
context system
```

3. At the *System* context prompt, type:

```
set clock-source { host | local }
```

Where:

`host`	Sets the clock source to the host computer. This is the default value.
`local`	Sets the clock source to the Memory Array.

Displaying the Software Version

1. Log into the Memory Array.
2. Navigate to the *Version* context level. At the root prompt, type:

```
context system version
```

3. At the *System* context prompt, type:

```
show
```

The command displays information similar to the following:

```
system version> show

software version:               <release>
software build date:            <date> 12:44:52
software build info:            built on swbuild.violintech.net by user common

CPL bootloader version:         <release>
OAM bootloader version:         <release>
CPL OS version:                 <release>
OAM OS version:                 <release>
CPL factory image version:      <release>
OAM factory image version:      <release>
upgrade image version:          (<release>_x8ans @ <date> 14:55

controller version info:        15749_x8a @ <date> 11:39
saxpow version info:            8418 @ 03/12/08 15:26
saxled version info:            7642 @ 01/25/08 13:48
```

Displaying the System IP Information

The following table lists the IP information that can be displayed.

Table 5.1 Displaying IP Information

Label	Description
dhcp	enabled
ip-address	10.10.0.126
netmask	255.255.255.0
gateway	10.10.0.1
mac-address	00:1B:97:00:00:05
dns-config	automatic
dns-nameserver	10.10.0.2
dns-search	domain.net
provisioned-info	See the following lines:
prov-ip-address	192.168.1.2
prov-netmask	255.255.255.0
prov-gateway	192.168.2.45

To display the IP address information:

1. Log into the CLI via a serial connection or the Ethernet interface (see Connecting to the CLI on page 76).

2. Navigate to the *Ethernet 0* context level. At the root prompt, type:

```
context chassis controller ethernet 0
```

3. At the *Ethernet 0* context prompt, type:

```
show
```

The command displays text similar to the following:

```
chassis controller ethernet 0> show

dhcp                enabled
ip-address          10.10.0.126
netmask             255.255.255.0
gateway             10.10.0.1
mac-address         00:1B:97:00:00:05
dns-config          automatic
dns-nameserver      10.10.0.2
dns-search          domain.net
provisioned-info
    prov-ip-address     192.168.1.2
    prov-netmask        255.255.255.0
```

This example indicates that DHCP is currently `enabled` and that the IP address is currently `10.10.0.126`. However, if you were to change the network configuration to static, the IP address used would be `192.168.1.2`.

Displaying the System's Hostname

1. Log into the Memory Array.
2. Navigate to the *System* context level. At the root prompt, type:

```
context system
```

3. At the *System* context prompt, type:

```
show name
```

The command displays information similar to the following:.

```
system name> show

name    Violin Memory Array
```

Retrieving the MAC Address

The MAC address of the Memory Array's Ethernet port can be found on the back of the system or in the system attribute files.

To retrieve the device MAC address and serial number, do one of the following:

1. From the CLI prompt, type:

```
show chassis controller ethernet 0
```

2. Log into the host computer and type:

```
vinfo
```

To add the Memory Array's MAC address to your DHCP server, consult your DHCP server documentation.

Clearing Provisioned IP Information

Provisioned IP address information can be cleared at any time.

1. Log into the CLI via a serial connection or the Ethernet interface (see Connecting to the CLI on page 76).
2. Navigate to the *Ethernet 0* context level. At the root prompt, type:

```
context chassis controller ethernet 0
```

3. At the *Ethernet 0* context prompt, type:

```
clear ip-address
```

The command displays information similar to the following:

```
chassis controller ethernet 0> clear ip-address

chassis controller ethernet 0> show

dhcp                 enabled
ip-address           10.10.0.126
netmask              255.255.255.0
gateway              10.10.0.1
mac-address          00:1B:97:00:00:06
dns-config           automatic
dns-nameserver       10.10.0.2
dns-search           violintech.net
```

Clearing Provisioned DNS Information

Clear provisioned DNS name server and DNS search domain information.

1. Log into the CLI via a serial connection or the Ethernet interface (see Connecting to the CLI on page 76).
2. Navigate to the *Ethernet 0* context level. At the root prompt, type:

```
context chassis controller ethernet 0
```

3. At the *Ethernet 0* context prompt, type:

```
clear dns-nameserver
clear dns-search
```

4. To commit the changes made, at the *System* context level command prompt, type:

```
save config
```

Displaying the VIMM RAID Group Mapping

The Memory Array supports up to 16 RAID groups per system. Each RAID group can contain up to five VIMMs and supports data striping across the VIMMs and RAID groups. Four VIMMs in a RAID group contain data and one contains parity information. Each RAID group can tolerate a single VIMM failure with no loss of data.

To display the mapping of the RAID groups across the VIMMs:

1. Log into the Memory Array.
2. Navigate to the *RAID Group* context level. At the root prompt, type:

```
context raid group <n>
```

Where:

n	Specifies the RAID group number.

3. At the *RAID Group* context prompt, type:

```
show maps
```

The command displays information similar to the following:

```
raid group 2> show maps

group-number          2
id                    76,13,44,67,69
state                 data,data,data,data,data
```

Where:

`group-number`	Indicates the RAID group ID.
`id`	Indicates the physical VIMM ID, and matches the slot number on the main board.

`state` Indicates the state of the VIMM in the 5-VIMM RAID group. Valid values are:

- `data`—VIMM is being used for data, either user data or parity data.
- `REBUILDING`—VIMM is currently being rebuilt by the RAID engine to recover from a prior failure.
- `FAULT`—A fault has occurred for this VIMM. If a spare is available, a rebuild occurs for this virtual VIMM.

Displaying the Spare VIMM Information

Using the CLI, display the ID numbers of the VIMMs that are designated as spares for use with the RAID groups.

1. Log into the Memory Array.
2. Navigate to the *RAID* context level. At the root prompt, type:

```
context raid
```

3. At the *RAID* context prompt, type:

```
show spare-ids
```

The command displays information similar to the following:

```
raid> show spare-ids

  spare-ids            30,31,32,52
```

Displaying and Setting Hardware Information

Display hardware information for the Memory Array, including:

- Fan tray status
- Which slots are populated with VIMMs
- Individual VIMM information
- Test slots
- System LEDs

Displaying VIMM Configuration Information

Display the VIMM configuration information at the *Slot* context level.

To display the VIMM configuration information:

1. Log into the Memory Array.
2. Navigate to the desired *Slot* context level. At the root prompt, type:

   ```
   context chassis board 0 slot <n>
   ```

   Where:

   n Specifies the VIMM slot number to move to. Valid values are in the range of 0–83, inclusive.

3. At the context prompt, type:

   ```
   show vimm
   ```

   This command displays text similar to the following:

```
chassis board 0 slot 56> show vimm

admin-state          up
oper-state           up
vimm-state           active
raid-group           0
vimm-type            FLASH
mem-type             SLC-NAND
raw-capacity         68.7GB (64GiB)
raw-capacity-bytes   68,719,476,736
fmt-capacity         45.1GB (42GiB)
fmt-capacity-bytes   45,097,156,608
part-number          1000159A-B-P4
serial-number        18094R00000003
mfg-date             20090422
fw-date              Thu Feb 11 17:54:00 2010
fw-version           0x39df
```

```
sw-date               Fri Feb 12 00:07:00 2010
sw-version            0x39dd
is-programmed         true
id-assigned           true
environment
  temperature           66C  (OK)
  sensor-1.2v           1.14
  sensor-1.8v           1.79
  sensor-2.5v           2.42
  sensor-3.3v           3.35
run-time-stats
  run-time              0 years, 0 days 15:22:04
  stats-date            Wed Feb 17 10:37:39 2010
  format-date           Tue Feb 16 19:41:08 2010
  user-reads            130,233,145
  user-read-bytes       133,358,740,480
  user-writes           130,233,037
  user-write-bytes      133,358,629,888
  ecc-cor-counts
      one-bit               3
      two-bits              0
      three-bits            0
      four-plus-bits        0
      total-cor             3
  ecc-corrected         3           (rate: 2.30e-08)
  raid-corrected        0           (rate: 0.00e+00)
  blk-boot-fails        0
  blk-erase-fails       0
  blk-prog-fails        0
  blk-ecc-thresh        0
  blk-ecc-uncor         0
erase-counts
  blk-erase-target      100,000
  blk-erase-avg         18.20
flash-health
  failed-blocks         342         (0.13%)
  failed-die            0           (0.00%)
  perform-thresh          0.95%     (OK)
  rebuild-thresh          0.64%     (OK)
  critical-thresh         0.48%     (OK)
```

Displaying the Number of VIMMs

Display the number of VIMMs in the system, the corresponding slot ID number, and the VIMM type.

To display a summary of VIMMs currently installed:

1. Log into the Memory Array.
2. Navigate to the *Board 0* context level. At the root prompt, type:

```
context chassis board 0
```

3. At the context prompt, type:

```
show vimm-summary
```

The command displays information similar to the following:

```
chassis board 0> show vimm-summary

num-vimms              42
installed-vimm-ids     3-8,12-18,22-27,35,38-45,48,60,64-69,71,75,76,78-80
flash-vimm-ids         3-8,12-18,22-27,35,38-45,48,60,64-69,71,75,76,78-80
admin-down-vimm-ids    39
installed-mem-raw      2886.2GB (2688GiB)
usable-mem-raw         2199.0GB (2048GiB)
parity-mem-raw          549.8GB ( 512GiB)
spare-mem-raw            68.7GB (  64GiB)
unavailable-mem-raw      68.7GB (  64GiB)
formatted-percentage   78.1%
usable-mem-formatted   1718.0GB (1600GiB)
```

Displaying Fan Status

Display the status of the system fans for maintenance and troubleshooting purposes. The fans are located in two fan trays designated as *1* (top) and *2* (bottom), and the fans are designated as *Left*, *Center*, and *Right*.

To display the current status of the fans:

1. Log into the Memory Array
2. Navigate to the desired *Fan* context level. At the root prompt, type:

```
context chassis fan-tray {1 | 2}
```

Where:

1	Specifies the top fan tray.
2	Specifies the bottom fan tray.

3. At the context prompt, type:

```
show fan {left | center | right}
```

Where:

`left`	Specifies the left fan in the specified fan tray.
`center`	Specifies the center fan in the specified fan tray.
`right`	Specifies the right fan in the specified fan tray.

The command displays information similar to the following:.

```
chassis fan-tray 1> show fan left

speed                high
rpm                  4800
```

Displaying Main Board Information

1. Log into the Memory Array.
2. Navigate to the *Board 0* context level. At the root prompt, type:

```
context chassis board 0
```

3. At the context prompt, type:

```
show info
```

The command displays information similar to the following:.

```
chassis board 0> show info

part-number 1000074S-C-08

version              0
serial-number        16095R00000237
mfg-date             20090723
environment
  ambient-temp       36C (OK)
  controller-temp    57C (OK)
  sensor-12v-a       11.80
  sensor-12v-b       11.83
```

Displaying Alarms and Logs

Display the current alarms that light the System LED on the Memory Array to help prevent system damage in the case of a fan failure, lid removal, or to diagnose performance problems when one or more VIMMs are affected by high temperatures.

See Appendix C, Alarm Reference for more information on alarms.

If the alarms and logs do not provide enough information to resolve an issue, run the `vincident` utility to collect information from the host computer and memory array, and contact HP Customer Support (or service provider). See vincident on page 155 and Contacting HP on page 19.

Displaying the Current Alarms

1. Log into the Memory Array.
2. Navigate to the *System* context level. At the root prompt, type:

```
context system alarms
```

3. At the *System* context prompt, type:

```
show
```

The command displays information similar to the following:

```
system> show alarms

alarm1 Lid removed
alarm2 Top fan tray removed
alarm3 Bottom-left fan running too slowly, 2000 RPM
alarm4 VIMM 14 low 1.8V, 1.68 volts; VIMM shut down
alarm5 VIMM 68: hot, 71 C
```

Displaying the System Log

Display the data contained in the log on the Memory Array. The log is displayed in a paginator window, unless you have disabled the paginator options. Setting the Pagination Mode on page 82 for detailed instructions on using the window pagination.

To display the system's log:

1. Log into the Memory Array.
2. Navigate to the *System* context level. At the root prompt, type:

```
context system
```

3. At the *System* context prompt, type:

```
show log
```

The command displays information similar to the following:

```
system> show log

xxx xx xx:xx:xx [000000000] INFO vtu_log_init(): ------------ LOG RESTART ------------
xxx xx xx:xx:xx [000000010] INFO ecpu_hwmgr_init(): Running fans at full speed
xxx xx xx:xx:xx [000000010] INFO main(): Main controller build ID: 12954
xxx xx xx:xx:xx [000000010] INFO main(): S/W Rel: <release>, Built: <date> 12:16:39 on
swbuild.violintech.net by user common
```

Displaying the Messages Log

The embedded operating system running on the Memory Array produces a message log similar to the `/var/log/messages` file found on Linux operating systems. The message log file created on the Memory Array contains system log and typical boot-up messages in addition to any `set` CLI commands that are run on the system.

To display the messages log file:

1. Log into the Memory Array.
2. Navigate to the *System* context level. At the root prompt, type:

   ```
   context system
   ```

3. At the *System* context prompt, type:

   ```
   show messages
   ```

The command displays information similar to the following:.

```
system> show messages

Nov 30 00:28:22 kernel: Linux version 2.6.17.11719 (common@swbuild.violintech.net) (gcc
version 3.4.6) #2 PREEMPT Mon Dec 22 12:38:51 EST 2008
Nov 30 00:28:22 kernel: ^O^M
Nov 30 00:28:22 kernel:
Nov 30 00:28:22 kernel: uClinux/Nios II
Nov 30 00:28:22 kernel: Altera Nios II support (C) 2004 Microtronix Datacom Ltd.

Nov 30 00:28:22 kernel: On node 0 totalpages: 32512
Nov 30 00:28:22 kernel:   DMA zone: 32512 pages, LIFO batch:7
Nov 30 00:28:22 kernel: Built 1 zonelists
Nov 30 00:28:22 kernel: Kernel command line: CONSOLE=/dev/ttyS0 root=/dev/ram0 rw
panic=10 mtdparts=violin-0:256k(BOOTROM)ro,128k(ENV1),128k(ENV2),1536k(FLATFS3),32m
(UPGRADE),8m(CPLgold)ro,16m(OAMgold)ro,6016k(SPARE) oeth_mac=00:1b:97:00:00:86
Nov 30 00:28:22 kernel: PID hash table entries: 512 (order: 9, 2048 bytes)
Nov 30 00:28:22 kernel: Dentry cache hash table entries: 16384 (order: 4, 65536 bytes)
Nov 30 00:28:22 kernel: Inode-cache hash table entries: 8192 (order: 3, 32768 bytes)
Nov 30 00:28:22 kernel: Memory available: 122496k/130048k RAM, 0k/0k ROM (1707k kernel
code, 4607k data)
```

Rebooting the Memory Array

When you reboot the Memory Array, you must specify which processors to restart. The two processors are:

1. **System**—Contains the software that manages the VIMM topology.

   WARNING! Restarting the system processor interrupts traffic and causes loss of some older system logs and diagnostic data. To preserve this diagnostic data it is recommended that the `vincident` and/or `save log` commands be used prior to reboot.

   Using a syslog server also ensures logs are stored prior to any reboot. See Displaying and Setting System Log (Syslog) Options on page 71.

2. **OAM**—Controls the administration function, such as user logins, system administration, and the CLI software.

Rebooting the System

Set the system reboot to run immediately or to be delayed in minutes, up to 1 day.

1. Log into the Memory Array.
2. At the root prompt, type:

```
reboot system {all | oam} [delay <n>]
```

Where:

`all`	Reboots both the *System* and *OAM* processors.
`oam`	Reboots only the OAM processor
`delay <n>`	Sets the time delay in minutes for rebooting the system. Valid values are in the range of 1 to 1440.

If you do not specify the time delay, you are also prompted whether you want to reboot the system immediately. Answer **y** to reboot immediately. If you answer **n**, the immediate reboot request is cancelled.

You are prompted to confirm scheduling the reboot. If you confirm the reboot it will be scheduled. While the system is rebooting, you will lose your CLI connection and have to log back into the interface.

Canceling a Scheduled Reboot

1. Log into the Memory Array.

2. Navigate to the *System* context level. At the root prompt, type:

```
cancel reboot
```

3. You will be prompted to confirm the cancelation of the reboot. Type **y** to confirm cancelling the reboot or type **n** to keep the scheduled reboot.

Displaying the Scheduled Reboot

To display when a reboot is scheduled to run:

1. Log into the Memory Array.
2. Navigate to the *System* context level. At the root prompt, type:

```
context system
```

3. At the *System* context prompt, type:

```
show reboot
```

The command displays information similar to the following:

```
system> show reboot

There is a reboot scheduled in 14 minute(s) and 8 seconds.
```

Upgrading the System Software

To upgrade the software on the Memory Array, perform the following steps:

1. Copy the upgrade image to a location on a host that is accessible to the Memory Array target system using FTP, HTTP, NFS, SCP, SFTP, or TFTP.
2. Set the upgrade path to the above location. The upgrade image will download to the upgrade partition of the Memory Array.
3. Set the upgrade partition to activate upon bootup.
4. Schedule the system reboot.
5. Reboot the host server.
6. Update the system software factory image.

Note:

- If you are upgrading from a previous release to the most current release, see the user documentation associated with the previous release for detailed upgrade instructions.
- If you are upgrading from a release prior to R2.2.0, before rebooting, you must use the following command to make the upgrade partition active upon reboot:

```
set system sw-upgrade active upgrade
```

The file name of the upgrade image is different depending on the PCIe interface you are using to connect to the Memory Array. The table below lists the image names.

Table 5.2 Upgrade Image Names

Image Name	Use for PCIe Interface	Interface ID
vtms-array-firmware-x4x4-<*release*>.upg	dual-x4 interface	Ports 1 and 2
vtms-array-firmware-x8-<*release*>.upg	single x8 interface	Port 1

Where <*release*> indicates the release number; for example, A3.7.2-18919.

Specify the path to the upgrade image using one of the methods listed in the following table.

Table 5.3 Downloading Methods and Example Paths

Using	Path Description
FTP	<*user*>@ftp://<*host_ip_addr*>/<*path*>/<*upgr_image*>.upg bob@ftp://10.10.0.15/pub/vtms-array-firmware-x8-A3.7.2-18919.upg
HTTP	http://<*host_ip_addr*>/<*path*>/<*upgr_image*>.upg http://10.10.0.15/vtms-array-firmware-x8-A3.7.2-18919.upg
NFS	nfs://<*host_ip_addr*>/<*path*>/<*upgr_image*>.upg nfs://10.10.0.15/vol/vol1/home/common/vtms-array-firmware-x8-A3.7.2-18919.upg
SCP	<*user*>@scp://<*host_ip_addr*>/<*path*>/<*upgr_image*>.upg You may be asked to establish the authenticity of the host when connecting. Type **yes** to continue downloading the software image from the host to the Memory Array. bob@scp://10.10.0.15/tftpboot/vtms-array-firmware-x8-A3.7.2-18919.upg
SFTP	<*user*>@sftp://<*host_ip_addr*>/<*path*>/<*upgr_image*>.upg You may be asked to establish the authenticity of the host when connecting. Type **yes** to continue downloading the software image from the host to the Memory Array. bob@sftp://10.10.0.15/tftpboot/vtms-array-firmware-x8-A3.7.2-18919.upg
TFTP	tftp://<*host_ip_addr*>/<*path*>/<*upgr_image*>.upg tftp://10.10.0.15/vtms-array-firmware-x8-A3.7.2-18919.upg

Note: Use SCP to copy the upgrade image to a host server with SSH access to your system, because it requires no server setup on the host server.

Using SCP

To upgrade the software on the Memory Array using SCP:

1. Copy the upgrade image provided by HP Customer Support onto the host server.
2. Log into the Memory Array.
3. Download the upgrade software to the Memory Array. At the root context prompt, type:

```
set system sw-upgrade path <user>@scp://<host_ip_addr>/
<path>/<memory-array_upgr_image>.upg
```

Where:

user	Specifies the user login name for the host.

host_ip_addr	Specifies the IP address of the host.
path	Specifies the path location of the upgrade file on the host.
upgr_image	Specifies the file name of the upgrade image. Make sure to use the appropriate image for your application.

You are prompted to confirm the download of the upgrade software. Upon confirmation, the upgrade software is downloaded to RAM on the main board and then copied into the upgrade partition of flash. That partition is then made to be the active one upon reboot.

The command displays information similar to the following:

```
> > set system sw-upgrade path bob@scp://10.10.0.15/home/bob_home/vtms-array-firmware-
x8-R3.4.0-15954.upg

  Do you wish to download this upgrade image (Y/N)? y
  Downloading...
  OK
  Verifying image ...

  Violin S/W Upgrade Image
  Header Ver.:  1
  Name: R3.4.0-15954_x8ans
  Created:      Tue July 10 2010 16:47:10 2009
  Revision:     13208
  Data Size:    15630085 Bytes = 14.91 MB
  Num Parts:    4

  #  PT Name       Offset     Length
  -- -- ---------- ---------- ----------
  0  0  BOOTROM    0x00000100 0x0002D60F
  1  1  CPL        0x00040000 0x006FC94D
  2  2  OAM        0x00740000 0x00526054
  3  3  MOZART     0x00C80000 0x00268005

  Verifying data checksum...OK
  OK
  Flash erase ...
  Erased 32768 Kibyte @ 0 -- 100% complete.
  OK
  Flash copy ...

.....................................................................................
................................done
  OK
  Verifying flash ...
  Verifying data checksum...OK
  OK
  Activating upgrade ...

  Updating partition information ...
  Upgrade complete, 'reboot system all' for changes to take effect.
```

4. Specify the system processor to restart when the system reboots. At the root context prompt, type:

```
reboot system all
```

The command displays information similar to the following:

```
> reboot system all

Do you wish to reboot the specified processor(s) now (Y/N)? y

Scheduling an immediate reboot.

> SYSTEM REBOOTING.......
The reboot request has succeeded.
```

5. While the system is rebooting, reboot your host computer. Log back into the Memory Array after both systems have completed rebooting.

Note:

- Make sure that your PCIe cable is connected to the correct PCIe port at the rear of the Memory Array. A green LED flashes to indicate the activated PCIe port(s).
- Once both the system and host computer have rebooted, the LED is solid green.
- If you have upgraded from a PCIe x4 connection to a PCIe x8 connection, use a PCIe x8 host card in your host computer.

6. You may need to update your device driver at this time. If so, you will receive the device driver files from HP Customer Support.

To restore your system to the factory default settings, see Restoring the Factory Default Settings.

Restoring the Factory Default Settings

You can return to the factory default settings at any time.

1. Log into the Memory Array.
2. Specify that the factory partition should be activated at system reboot. At the root context prompt, type:

```
set system sw-upgrade active factory
```

The command displays information similar to the following:

```
> set system sw-upgrade active factory

Updating partition information ...
Upgrade complete, please reboot in order to take effect.
```

3. Set the system processor to restart when the system reboots. At the root context prompt, type:

```
reboot system all
```

WARNING! This procedure interrupts service.

The command displays information similar to the following:

```
> reboot system all

  Do you wish to reboot all processors now (Y/N)? y

  Scheduling an immediate reboot.

  > SYSTEM REBOOTING.......
  The reboot request has succeeded.

  Booting Violin 1010

  Starting Management Interfaces
  Restored configuration settings from flash
  Verifying configuration settings
                                    .....
                                .....
                            .....
                        .....
                    ..... ~
                .....     ~
            .....         ~
        .....           ~
    .....           ~
.....           ~ ~ ~
   .....          ~  ___  ___
.....               ~  ||  //  o         /  o
..                   ~    || //     .--.   /     /_-_
                      ~     ||//  /  /   /  /  /  /   /
                    ~       ||/  /  /___/  /  /  /   /
                ~  ___  ___
~         ~       //|  //|
    ~           //|| //||   .--. /_ _  .--.  /.-- .  .
               // ||// ||  /__/ / / / /   / /    /  /
              //  ||/  || /__  / / / /___/ /    /__/
                                                  /
  http://www.violin-memory.com/                .__/

  IP config is DHCP


  Violin Memory Appliance 1010
  S/W Version: R3.4.0-15954

  violin login:
```

4. While the system is rebooting, reboot your host server.
5. Log back into the Memory Array when it is finished rebooting.

Displaying the Upgrade Path

After setting the upgrade path, and before the system reboots, display the path to the upgrade software.

1. Log into the Memory Array.
2. Navigate to the *Sw-upgrade* context level. At the root prompt, type:

```
context system sw-upgrade
```

3. At the context prompt, type:

```
show path
```

The command displays information similar to the following:

```
system sw-upgrade> show path

Upgrade image path = 'bob@ftp://10.10.0.15/pub/v1010_x8_p1_d.img'
```

Updating the System Software Factory Image

Update the system software factory image if you have both factory and upgrade images installed on the Memory Array and you want to make the current upgrade image the factory image.

1. Copy the current firmware image into the *factory* partition. At the root prompt, type:

```
copy system sw-upgrade active factory
```

2. You are prompted to confirm. Upon confirmation, the system reboots.

WARNING! This procedure interrupts service.

CHAPTER 6 Servicing the Array

This chapter describes how to service the Memory Array by following safety precautions while replacing the fan trays, AC power supplies, and VIMMs in the following sections.

- Guidelines for Servicing the System on page 108
- Testing the LEDs on page 109
- Replacing the Fans on page 111
- Replacing the AC Power Supplies on page 112
- Replacing VIMMs on page 113

Guidelines for Servicing the System

WARNING! Only authorized, qualified, and trained personnel should attempt to service or maintain this equipment.

Caution: Read this guideline section before proceeding with any of the service procedures.

See System LEDs on page 25 for detailed information on the system LEDs located on the front and rear of the Memory Array.

Safety Precautions

The following servicing guidelines must be followed when performing maintenance on the Memory Array.

- Use caution when replacing the fans. When the system is powered on, the fans in the fan trays are moving and may cause damage to items that come in contact with the moving parts.
- When using metal tools such as screwdrivers, exercise caution to ensure that they do not come in contact with any part of the system other than to remove the necessary screws. Failure to observe these precautions creates the potential risk of creating a short circuit within the system.
- The VIMMs are hot-swappable, but remove both of the power feeds from the system to eliminate the risk of equipment damage and personal injury.
- Do not leave the cover off of the system for any reason except VIMM replacement. Loose metal objects from other sources may fall into the system causing a short.

ESD Precautions

Follow these precautions to prevent ESD damage to the Memory Array.

- Wear ESD protection, such as a wrist or ankle strap that is properly grounded.
- Ensure the system is properly grounded, as described in Connecting Equipment Ground on page 48.
- Ensure that you are properly discharged before servicing the system.

Testing the LEDs

Perform functional tests on the LEDs associated with the VIMM slots and the system LEDs located on the front and rear of the Memory Array.

Displaying the Status of the System LEDs

1. Log into the Memory Array.
2. Navigate to the *System* context level. At the root prompt, type:

```
context system
```

3. At the context prompt, type:

```
show led-state
```

The command displays information similar to the following:.

```
system> show led-state

power-a              on
power-b              on
status               on
alarm                off
```

Testing the System LEDs

This test lights all system and VIMM LEDs for two seconds, turns them off for two seconds, then reverts the LEDs to their previous states. The exceptions to this are the *Power A* and *Power B* LEDs, which are controlled by the presence of power.

To test the system LEDs:

1. Log into the Memory Array.
2. Navigate to the *System* context level. At the root prompt, type:

```
context system
```

3. At the context prompt, type:

```
set led-test start
```

Displaying the Status of the VIMM LEDs

1. Log into the Memory Array.
2. Navigate to the *System* context level. At the root prompt, type:

```
context chassis board 0 slot <n>
```

Where:

n Specifies the VIMM slot ID. Valid values are in the range of 0-83, inclusive.

3. At the context prompt, type:

```
show led-state
```

The command displays information similar to the following:.

```
chassis board 0 slot 12> show led-state

led-state            slow-flash
```

Testing the VIMM LEDs

Test the LEDs associated with a specific VIMM. The slot ID is specified when you navigate to the Slot context level. The LEDs stay lit for two seconds, blink fast for two seconds, blink slowly for two seconds, then return to the previous state.

To test the VIMM LEDs:

1. Log into the Memory Array.
2. Navigate to the *Slot* context level. At the root prompt, type:

```
context chassis board 0 slot <n>
```

Where:

n Specifies the VIMM slot ID. Valid values are in the range of 0-83.

3. At the context prompt, type:

```
set led-test start
```

Replacing the Fans

The six fans are installed prior to shipping, but may need to be replaced in the unlikely event of a fan failure. The fans are hot-swappable components and can be replaced while the Memory Array is in-service.

WARNING! Allow the fans to slow down before removing them.

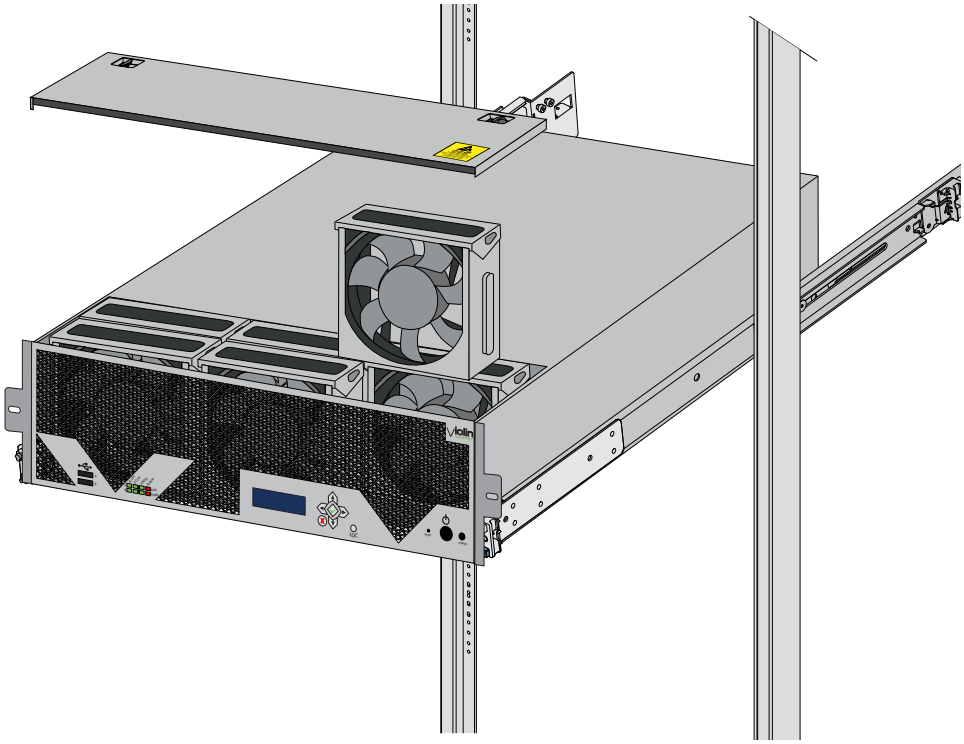


Figure 6.1 Replacing a Fan Module

To replace a fan:

1. Remove the lid by turning the latch clockwise on the VIMM top cover. The latch holds both the top cover and the fan cover in place. Then pull on the rubber tabs to remove the lid.
2. Pull the handle on the fan to remove it from the chassis and replace with a new fan module.
3. Place a new fan tray module in the empty fan slot and push it into the chassis until the connector is securely seated in the chassis connector.
4. Put the lid back on and secure it by turning the latch counterclockwise.

Replacing the AC Power Supplies

The redundant AC power supplies can be hot-swapped at any time if one fails during operation of the Memory Array.

To replace an AC power supply:

1. At the rear of theMemory Array, disconnect the AC power cord from the system and the wall outlet.
2. Remove the module by pushing on the green tab at the right of the power supply faceplate and pulling the power supply firmly by the handle over the fan, as illustrated in the figure below.

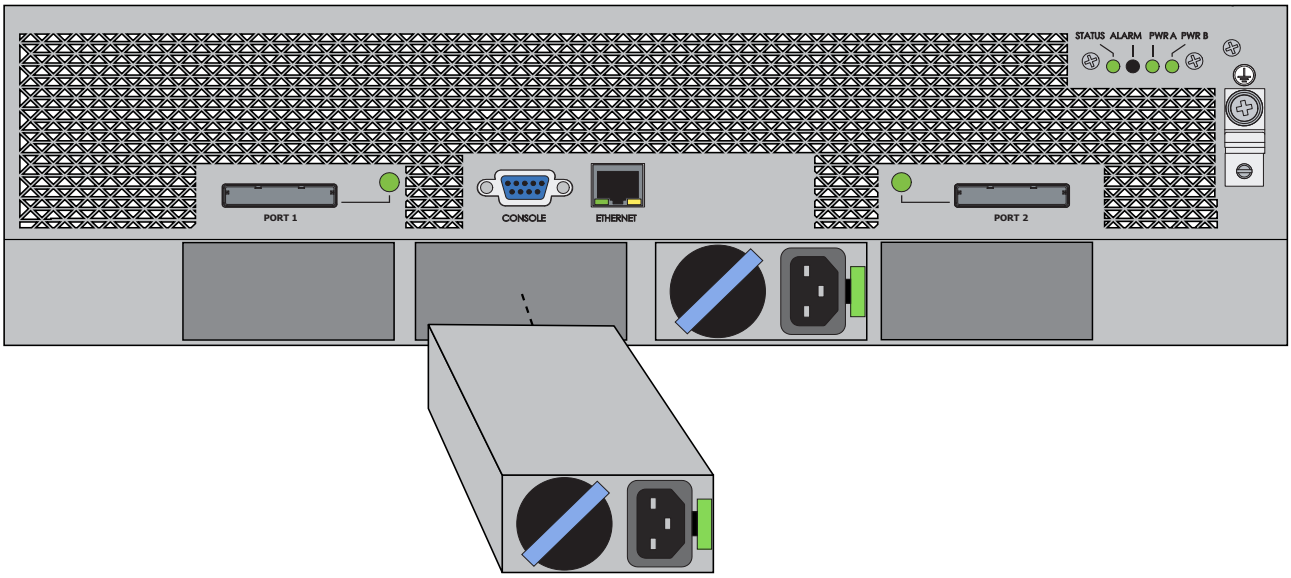


Figure 6.2 Replacing an AC Power Supply

3. Orient the power supply, as shown in the figure above, with the faceplate towards the installer and the AC cord receptacle to the right.
4. Place the new power supply in the chassis and push firmly until the green tab clicks into place.

Replacing VIMMs

There are up to four spare VIMMs in the Memory Array system. If a VIMM experiences errors:

- Route the data to a spare VIMM.
- Remove the errored VIMM from the RAID group.
- Power down the slot in which the VIMM is located.
- Replace the errored VIMM with a new, working VIMM and place as a spare in the system.

Caution: Wear a grounding strap that has been attached to the Memory Array chassis to avoid damage from static electricity.

To replace a VIMM:

1. View the alarms and note which VIMM needs replacing.
2. Slide the Memory Array partially out of the equipment rack. Remove the top cover by turning the latch and pulling the two rubber tabs.
3. Looking at the bank of VIMMs in the chassis, locate the damaged VIMM by the number that is located on the main system board. The red LED on the VIMM and the associated slot LED on the main board will be lit.

   See System LEDs on page 25 for detailed information on the system LEDs.

   WARNING! If you are replacing a functioning VIMM, then the red LED on the VIMM and the associated slot LED will not be lit solid red, indicating the power has been removed from the slot, until you manually change the administrative state of the VIMM. Make sure the red LEDs are lit before removing the VIMM.

   Prior to removing a properly functioning VIMM, you must change the administrative state to “down”. If you fail to do so, the VIMM, the slot that it is in, or the main board may experience permanent electrical damage and will no longer operate.

Note: Skip step 4 if the VIMM is not functioning properly and the red LED is lit solid red.

4. Remove power to the VIMM by changing its administrative state. Log in to the CLI from the host computer and, at the system prompt, type:

   ```
   set chassis board 0 slot <n> vimm admin-state down
   ```

   Where:

   n Specifies the VIMM slot. Valid values are in the range of 0-83.

5. Press firmly down on the latches until the VIMM disengages from the slot. Lift the VIMM out straight vertically to avoid shorting the pins and place in a static bag.
6. Align the new VIMM with the empty slot, as shown in the following figure.

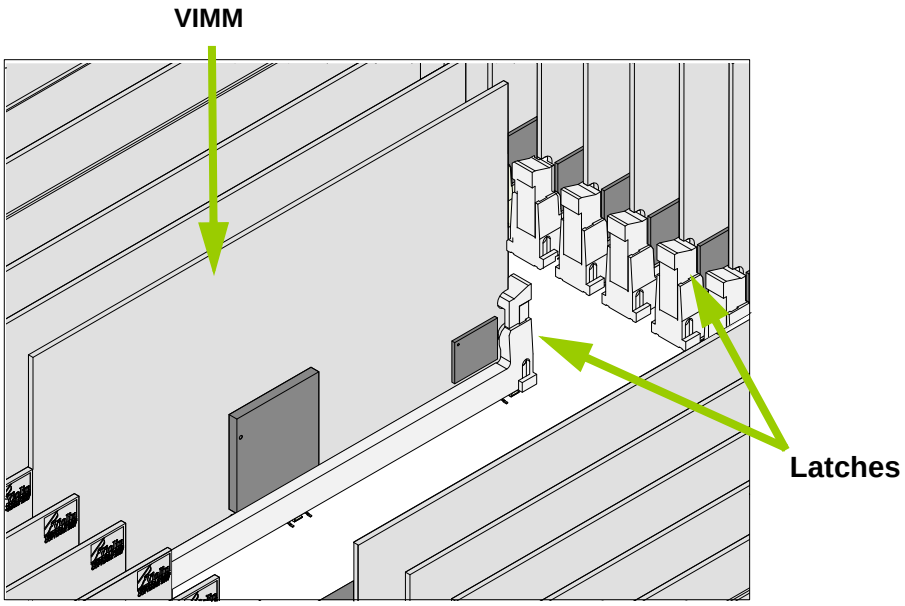


Figure 6.3 Inserting the Replacement VIMM

7. Firmly press the VIMM into the slot until the latches click close. After a short time interval, when the system software recognizes the new VIMM, program the FPGA on the VIMM, and clear the alarm for that slot.

   The red LED will turn off, indicating no existing alarms for that VIMM.

PART III

Host Utilities

Chapter 7 Linux Drivers

Chapter 8 Windows Drivers

Chapter 9 Violin Utilities

Chapter 10 Performance Tuning and Troubleshooting

CHAPTER 7 Linux Drivers

This chapter describes the configuration of a direct-attached Memory Array system using a Linux host. Topics covered include system prerequisites, installation of the Linux drivers, installation of the Violin Utilities, and creation of block device partitions.

- Linux Drivers Overview on page 118
- Installing Linux Driver Prerequisites on page 119
- Installing Linux Drivers on page 120
- Loading and Unloading Linux Drivers on page 125
- Installing the Violin Utilities on page 127
- Configuring Partitions and Storage Devices on page 129

Linux Drivers Overview

In a direct-attached configuration, the Linux driver enables the host (a Linux machine) to access block storage on a Memory Array.

The Linux driver (`vtms-linux-driver`) must be installed on the host machine if the Memory Array is to be directly attached to a Linux host. If the Memory Array is to be directly attached to a Windows host, see Windows Drivers on page 135.

Understanding Linux Driver Types

Linux drivers may be implemented as one of three different device types: character devices, block devices, or SCSI devices. The Memory Array system supports only one device type at a time.

The Linux driver accesses the system as any of the following device types:

`Character`	Reference design for raw access to the Memory Array.
`Block`	The default and preferred driver mode. Allows for file system creation, mounting, and optional host buffer cache usage.
`SCSI`	Provides SCSI disk devices for certain applications that expect `/dev/sd*` devices. Performance will be slower than block mode due to SCSI emulation.

In general, a Linux driver provides block device access to the Memory Array enabling the host to create and mount block storage.

This chapter describes the steps required to install and configure Linux drivers as block devices only. If you plan to use the Linux driver to enable character or SCSI connections, contact HP Customer Support.

Installation and Configuration Overview

The Linux driver enables a direct-attached connection between a Memory Array and a Linux host machine.

During Phase 3 of the Memory Array deployment, you may choose to configure the system for block storage or direct-attached storage. If you choose direct-attached configuration, you must install the appropriate device driver (Linux or Windows) and the Violin Utilities on the host machine.

In general, the configuration of a direct-attached Memory Array system using a Linux host is a five-step process.

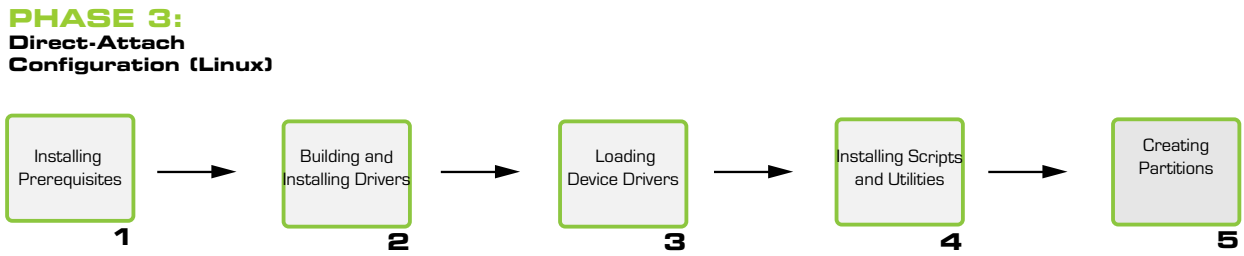


Figure 7.1 Direct-Attach Configuration (Linux) Flowchart

- **Step 1: Installing Linux Driver Prerequisites**: Ensure that all of the required packages are installed on the Linux host before you install and build the Linux driver.
- **Step 2: Installing Linux Drivers**: Install the Linux driver on the host, build the driver, and configure the host to load the Linux driver manually or as a module.
- **Step 3: Loading the Linux drivers**: Depending upon where the Linux drivers were installed, they may be loaded manually or automatically as modules when the host boots up.
- **Step 4: Installing Violin Utilities**: The Violin Utilities commands enable you to monitor and fine tune the performance of the Memory Array.
- **Step 5: Configuring Partitions and File Systems**: If the Linux driver is used as a block device, you may create partitions and file systems.

Installing Linux Driver Prerequisites

The first step towards configuring a direct-attached Memory Array system with a Linux host is to ensure that all of the required packages are installed on the Linux host.

Three packages must be installed on the Linux host before you can install the Linux driver: the Kernel Development Package, the GCC Compiler, and the Libaio Development Package.

The actual name of each package may vary depending on the Linux distribution.

Kernel Development Package

The Kernel Development Package provides the kernel headers and sources for building any Linux kernel module. The package(s) are typically named `kernel-devel` or `kernel-sources / kernel-headers`.

If a kernel was custom built from `http://kernel.org/` sources, the kernel build tree must be available for the Linux driver to reference.

GCC Compiler

The GCC Compiler compiles the Linux kernel and modules. The GCC Compiler version should match the version that was used to build the running kernel.

Libaio Development Package

The Libaio Development Package is an asynchronous I/O development package for applications that use `libaio.so`.

The `perf_test` benchmark utility (included among the Violin Utilities) uses the asynchronous I/O features to provide high performance asynchronous I/O benchmarking. For more information on the `perf_test` utility and asynchronous I/O testing, see Network-Layer Performance Testing on page 172.

Install both the `libaio` and `libaio-devel` packages before installing the Violin Utilities. The following example installs the required packages on a CentOS 5.5 x86_64 system. At the root prompt, type:

```
# yum install gcc kernel-devel-`uname -r`.x86_64 libaio-
devel
```

Installing Linux Drivers

The second step towards configuring a direct-attached Memory Array system with a Linux host is to install the Linux driver.

The Linux driver enables a direct-attached PCIe connection between the Memory Array and the Linux host machine.

In the course of installing the Linux driver, you must decide whether the Linux driver is to be loaded manually or loaded automatically as a module when the host boots up.

This section describes the installation and removal of the Linux drivers:

- Installing Linux Drivers on page 121
- Removing the Linux Drivers on page 125

Installing Linux Drivers

Before installing the Linux driver, ensure that the host computer has the kernel-devel RPM installed and GCC installed for the running kernel, which will allow the driver source to compile. These packages may not be installed by default on the Linux host.

The information shown in the following examples may vary from your installation depending on the host computer kernel and distribution.

The Linux driver may be installed on either a Linux kernel that is running or not running. Both procedures are documented in this section.

- Installing Linux Drivers on Running Linux Kernels on page 121
- Installing Linux Drivers on Non-Running Linux Kernels on page 123

Installing Linux Drivers on Running Linux Kernels

To load the Linux driver onto the host computer:

1. Power up the Memory Array and verify the PCIe connectivity between the Memory Arrayand the host computer before you install and load the Linux driver onto the host.

   Because the PCIe Hot Plug is not supported by most current BIOS versions, you must power up the Memory Array before powering up the host computer.

2. Log into the host computer as `root`.
3. Download the Linux driver install file (`vtms-linux-driver<release>.run`) from the HP Support page.

   Where `<release>` indicates the release number; for example, `D4.5.4.1.`

4. Save the Linux driver install file to a suitable location on the host.
5. Open a terminal shell window and navigate to the location of the Linux driver install script.
6. To run the Linux driver install script, type:

```
./vtms-linux-driver-<release>.run
```

The script begins installing the driver, as shown in following example:

```
# ./vtms-linux-driver-<release>.run
Copying to a temporary location...
Creating directory vtms-linux-driver-<release>
Verifying archive integrity... All good.
Uncompressing Violin Memory, Inc. V1010 Linux Driver
source.....................

Current settings detected:
-------------------------------------------------
Kernel     = 2.6.18-194.8.1.el5
Kernel Dir = /lib/modules/2.6.18-194.8.1.el5/build
Kernel GCC = 4.1.2
GCC ver    = 4.1.2
Arch       = x86_64

View the driver README.txt? [n]: n
Skipping /tmp/vtms-linux-driver-<release>/README.txt
```

7. To view the `README.txt`, type `y`.
8. When prompted to build the Linux driver type `y`:

```
Build the driver now? [y]: y

Detected kernel build dirs:
-------------------------------------------------
/lib/modules/2.6.18-194.8.1.el5/build

Build dir [/lib/modules/2.6.18-194.8.1.el5/build]:
```

9. At the prompt, you are asked if you want to install the Linux driver in the `/lib/modules` directory.
   - If you select `yes`, the Linux driver module is added to the kernel modules.
   - If you select no, the Linux driver is not installed to the `/lib/modules` directory.

   A message appears stating that the Linux driver installation is complete.

10. Once the installation is complete you may load the Linux driver for use.
    - If you installed the Linux driver in the `/lib/modules` directory, see Loading Linux Drivers as Modules on page 126 for detailed instructions.
    - If you did not install the Linux driver in the `/lib/modules` directory, see Loading Linux Drivers Manually on page 125.

Installing Linux Drivers on Non-Running Linux Kernels

To install the Linux driver on a non-running kernel:

1. Power up the Memory Array and verify the PCIe connectivity between the Memory Array and the host computer before installing and loading the Linux driver onto the host computer.

   Because the PCIe Hot Plug is not supported by most current BIOS versions, you must power up the Memory Array before powering up the host computer.

2. Log into the host computer as `root`.

   If you are not logged in as root, you will be prompted to type in the root password during the installation process.

3. Download the Linux driver install file (`vtms-linux-driver<release>.run`) from the HP Support page.

   Where `<release>` indicates the release number; for example, `D4.5.4.1.`

4. Save the Linux driver install file to a suitable location on the host.
5. Open a terminal shell window and navigate to the location of the Linux driver install script.
6. To run the Linux driver install script, type:

   ```
   ./vtms-linux-driver-<release>.run
   ```

   The script begins installing the driver as shown in the example:

   ```
   # ./vtms-linux-driver-<release>.run
   Copying to a temporary location...
   Creating directory vtms-linux-driver-<release>
   Verifying archive integrity... All good.
   Uncompressing Violin Memory, Inc. V1010 Linux Driver
   source.....................

   Current settings detected:
   -------------------------------------------------
   Kernel     = 2.6.18-194.8.1.el5
   Kernel Dir = /lib/modules/2.6.18-194.8.1.el5/build
   Kernel GCC = 4.1.2
   GCC ver    = 4.1.2
   Arch       = x86_64

   View the driver README.txt? [n]:
   ```

7. To view the README.txt, type `y`.

8. When prompted to build the Linux driver type y. At the Build dir prompt, type the path to the non-running build directory:

```
Build the driver now? [y]:

Detected kernel build dirs:
-------------------------------------------------
/lib/modules/2.6.18-194.8.1.el5/build

Build dir [/lib/modules/2.6.18-194.8.1.el5/build]:
```

9. When prompted, follow the instructions to install the Linux driver into the `/lib/modules` directory.
   - If you select `yes`, the Linux driver module will be added to the kernel modules.
   - If you select no, the Linux driver is not installed to the `/lib/modules` directory.

10. Once the installation is complete you may load the Linux driver for use.
   - If you installed the Linux driver in the `/lib/modules` directory, see Loading Linux Drivers as Modules on page 126 for detailed instructions.
   - If you did not install the Linux driver in the `/lib/modules` directory, see Loading Linux Drivers Manually on page 125.

11. To check to see if the Linux driver is installed, type:

```
rpm -q kernel-devel
```

Preventing Linux Drivers from Loading on Boot Up

To prevent the kernel from loading the Linux driver at boot up, add the Linux driver to the `/etc/modprobe.d/blacklist` file. Type `modprobe vtms` once the system is booted to load the driver.

Ensuring that the Linux Driver Loads on Boot Up

Depending on your Linux distribution, you may need to modify the `/etc/modprobe.conf` file to include an alias for the Memory Array if you want the Linux driver to automatically load on boot up.

To add an alias for the Linux driver, edit the file such as the following:

```
alias scsi_hostadapter/V vtms
```

Where N specifies the next available integer or blank if it is the first alias entry for a SCSI host adapter.

Removing the Linux Drivers

1. Log into the Linux host as `root`.
2. Open a terminal window and at the system prompt, type:

```
cd /tmp/vtms-linux-driver-<release>

make uninstall
```

The Linux driver is removed from the `/lib/modules` directory, but can still be loaded and unloaded using the steps described in Loading and Unloading Linux Drivers on page 125.

Load the Linux driver again if you want to use the Memory Array. See Installing Linux Drivers on page 121 for details on installing the Linux driver.

Loading and Unloading Linux Drivers

The third step towards configuring a direct-attached Memory Array system with a Linux host is to load the Linux driver.

Linux drivers may be configured to be loaded automatically as modules by the Linux host or to require manually loading.

This section describes the loading and unloading of Linux drivers in three topics:

- Loading Linux Drivers Manually on page 125
- Loading Linux Drivers as Modules on page 126
- Unloading the Linux Driver on page 127

Loading Linux Drivers Manually

If you did not install the driver in the `/lib/modules` directory, you must reload the driver manually after each system reboot.

To load the Linux driver manually:

1. Power up the Memory Array and verify the PCIe connectivity between the Memory Array and the host computer before installing and loading the Linux driver onto the host computer.
2. Log into the host computer as `root`.

3. At the system prompt, navigate to the following directory:

```
cd /tmp/vtms-linux-driver-<release>/<kernel_version>/
<architecture_type>
```

Where:

`<release>`	Indicates the release number, such as D4.5.4.1.
`<kernel_version>`	Indicates the kernel version, such as `2.6.9-42.ELsmp`.
`<architecture_type>`	Indicates the architecture type of the host computer, such as `x86_64`.

4. Load the Linux driver; at the system prompt, type:

```
./load_strad.sh
```

5. At any point, if you decide to install the Linux driver in `/lib/modules` at the system prompt, type:

```
cd /tmp/vtms-linux-driver-<release>

make install

depmod
```

Where:

`<release>`	Indicates the release number, such as `4.5.4.1`.

Loading Linux Drivers as Modules

To load the Linux drivers as modules:

1. Power up the Memory Array and verify the PCIe connectivity between the Memory Arrayand the host computer before installing and loading the Linux driver onto the host computer.
2. Log into the Linux host as `root`.
3. Open a terminal window.
4. **(Optional)** To update the dependency mappings of newly installed modules, at the system prompt, type:

```
depmod
```

You may need to run `depmod` for modprobe to detect the new module.

5. To load the Linux driver, at the system prompt, type:

```
modprobe vtms [<device_type>]
```

Where `<device_type>` indicates device type of the loaded driver. Valid values are:

`none`	Load as a block device
`[use_cdev=1]`	Load as a character device
`[use_scsi=1]`	Load as a SCSI device

After loading the Linux driver, create partitions and file systems on the Memory Array or directly access the character device.

Unloading the Linux Driver

1. Log into the host computer as `root`.
2. Open a terminal window.
3. To unload the Linux driver, at the system prompt, type:

```
rmmod vtms
```

Installing the Violin Utilities

The fourth step towards configuring a direct-attached Memory Array system with a Linux host is to install the Violin Utilities.

The Violin Utilities are tools designed to enable you monitor the performance of a direct-attached Memory Array system. Using the Violin Utilities, you may retrieve detailed information about the Memory Array and data transfer counts that enable you to configure the system for optimal performance.

Use the Violin Utilities commands in the `/usr/local/bin` directory to display information on the Memory Array.

Table 7.1 Memory Array Commands for Viewing Linux Driver Information

Utility	Description
`perf_test`	A multi-threaded AIO-capable disk benchmark utility. See Performance Testing Using perf_test on page 174 for detailed instructions on using this utility.
`vcounts`	Displays Memory Array I/O counters.

Table 7.1 Memory Array Commands for Viewing Linux Driver Information

Utility	Description
`veeprom`	Displays information, such as the main board serial number and the management MAC address.
`vinfo`	Displays driver version and registry tunable parameters.
`vpartial`	Displays Memory Array partial flash page counters.
`vstat`	Displays Memory Array status information.
`vzero`	Resets Memory Array I/O counters to zero.

For the complete syntax and usage details of each command, see Violin Utilities on page 149.

On each command, specify the optional device index (`[ <device_index> ]`) to list the information for a particular Memory Array. If you do not specify an individual device, the command lists the information for all the Memory Arrays found.

Installing the Violin Utilities on Linux Hosts

To install the Violin Utilities onto the host computer:

1. Log into the host computer as `root`.
2. Download the Violin Utilities package tgz file (`vtms-linux-utils-<release>.tgz`) from the HP Support page.

   Where `<release>` indicates the release number, such as `D4.5.4.1.`
3. Extract the contents of the compressed file to a suitable location on the host.
4. Open a terminal shell window and navigate to the location of the Violin Utilities install script (`vtms-linux-<release>.tar`).
5. To run the Violin Utilities install script, type:

   ```
   ./vtms-linux-utils-<release>.run
   ```

   Where `<release>` indicates the release number, such as `D4.5.4.1.`

Configuring Partitions and Storage Devices

In most deployments, the fifth step towards configuring a direct-attached Memory Array system with a Linux host is to configure block device partitions.

Create block device partitions on the Memory Array for creating multiple file system partitions. Use the `/dev/vtmsa` device for creating file systems only if a single large partition is required.

When creating partitions for 4kB partition alignment, the fdisk utility has an -S option that lets you override the default geometry of 63 sectors per track. Use `fdisk` with the `-S56` option for 4kB alignment on created partitions. For more information see Memory Array Flash 4kB Alignment on page 169.

Creating Block Device Partitions

To create a block device partition on the Memory Array:

1. Log into the host computer as `root`.

   The following command is only needed when splitting the block device into multiple partitions.

2. First, open the device for adding partitions by typing the following at the command prompt:

   ```
   fdisk /dev/vtmsa
   ```

   Where `/dev/vtmsa` specifies the device to open.

   The information shown below is returned and you will be in the block device setup menu.

   ```
   # fdisk /dev/vtmsa

   The number of cylinders for this disk is set to 16709.
   There is nothing wrong with that, but this is larger
   than 1024, and could in certain setups cause problems
   with:
   1) software that runs at boot time (e.g., old versions
   of LILO)
   2) booting and partitioning software from other OSs
     (e.g., DOS FDISK, OS/2 FDISK)

   Command (m for help):
   ```

3. At the Command prompt, type n to create a new partition:

```
n
```

Where n specifies to create a new partition.

The command displays information similar to the following:

```
Command (m for help): n
Command action
  e   extended
  p   primary partition (1-4)
```

4. Next, at the Command prompt, create the new partition by typing:

```
p
```

Where p creates a primary partition.

The command displays information similar to the following:

```
Command action
  e   extended
  p   primary partition (1-4)
p
Partition number (1-4): 1
First cylinder (1-16709, default 1):
Using default value 1
Last cylinder or +size or +sizeM or +sizeK (1-16709, default
16709): 8000
```

- Specify the partition number if you will be creating more than one partition on the device, or accept the default value of 1 by pressing the Enter key. The default value to set the beginning cylinder to is 1, which can be changed if needed.
- Specify the size of the block device or accept the default value of the available memory by pressing the Enter key.

5. Next, at the Command prompt, write the new partition by typing:

```
w
```

Where w writes the partition table to disk and exit.

The command displays information similar to the following:

```
Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.
Syncing disks.

#
```

The system command prompt is returned. Finish by creating the file system that uses the new block device partition, creating the new mount path, and mounting the new block device file system.

6. Create a file system on the block device by typing:

```
mkfs -t ext3 /dev/vtmsa<n>
```

Where:

`-t ext3`	Specifies the type of file system to be built.
`/dev/vtmsa<n>`	Specifies the name of the new file system, where <n> is the assigned device number.

The command displays information similar to the following:

```
# mkfs -t ext3  /dev/vtmsa1
mke2fs 1.39 (date)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
176160768 inodes, 352321536 blocks
17616076 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=4294967296
10752 block groups
32768 blocks per group, 32768 fragments per group
16384 inodes per group
Superblock backups stored on blocks:
       32768, 98304, 163840, 229376, 294912, 819200, 884736,
1605632, 2654208,
        4096000, 7962624, 11239424, 20480000, 23887872,
71663616, 78675968,
        102400000, 214990848

Writing inode tables: done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information:
done

This filesystem will be automatically checked every 37
mounts or
180 days, whichever comes first. Use tune2fs -c or -i to
override.
```

7. Create the new mount path for mounting the block device by typing:

```
mkdir /mnt/strad
```

Where `/mnt/strad` specifies the name of the new mount path.

8. At the command prompt, mount the new file system by typing:

```
mount –t ext3 /dev/vtmsa<n> /mnt/strad
```

Where:

`-t ext3`	Specifies the type of file system to mount.
`/dev/vtmsa<n>`	Specifies the name of the new file system, where <n> is the assigned device number.
`/mnt/strad`	Specifies the name of the new mount path.

9. To unmount the file system, at the command prompt, type:

```
umount /mnt/strad
```

Enabling Host to Automatically Mount Partitions

By editing the `/etc/fstab` file, you can enable the host computer to automatically mount Memory Array partitions on boot up.

1. Log into the host computer as `root` and change directories into `/etc`.
2. Edit the `/etc/fstab` file with the desired text editing tool.
3. Add the following row to the file, changing the values to appropriate ones for your system:

```
/dev/<partition> /mnt/<mount_pth> <fs_type> <mount_opt>
<dump_opt> <fsck_opt>
```

Where:

`/dev/<partition>`	Specifies the partition name.
`/mnt/<mount_pth>`	Specifies the default mount path.
`<fs_type>`	Specifies the file system type of the device.
`<mount_opt>`	Specifies the mount options, which are separated by commas, for the file system. The available options are: `auto` | `noauto`—Specifies whether to automatically mount the device or not. With `noauto`, the device can only be mounted explicitly. `user` | `nouser` —Specifies whether a typical user versus the "root" user can mount the device. `exec` | `noexec` —Specifies that the binaries contained on the partition can or cannot be executed. Not recommended for a root partition. `ro`—Mounts the device read-only. `rw`—Mounts the device read-write. `sync` | `async` —Specifies how input and output is performed by the device. For example, a command is executed at the same time it has been issued. `defaults` —Specifies to use the default options, which are: `rw`, `suid`, `dev`, `exec`, `auto`, `nouser`, `async`.

`<dump_opt>`	Specifies whether the device is backed up by the `dump` utility or not. If `0` is specified, the device will not be backed up. `1` specifies that the device will be backed up.
`<fsck_opt>`	Specifies what order the devices are checked. If `0` is specified, the device won't be checked by `fsck`.

CHAPTER 8 Windows Drivers

This chapter describes the installation of the Memory Array Storport driver and Violin Utilities on a Windows host computer.

- Windows Driver Overview on page 136
- Installing Prerequisites on page 136
- Installing Windows Drivers on page 137
- Installing the Violin Utilities on page 144

Windows Driver Overview

In a direct-attached configuration, the Windows driver enables the host (a Windows machine) to access block storage on a Memory Array.

The Windows Storport driver must be installed on the host machine if the Memory Array is to be directly attached to a Windows host. If the Memory Array is to be directly attached to a Linux host, see Linux Drivers on page 117.

Installation and Configuration Overview

Memory Arrays may be configured to be used for block storage using vSHARE or direct-attached storage.

The installation and configuration of Storport driver is required only if you plan to directly attach the Memory Array to a Windows host.

In general, the installation of the Memory Array Storport driver and the associated Violin Utilities is a three-step process:

- **Step 1: Installing Prerequisites**: Ensure that all of the required packages are installed on the Windows host before you install the Windows driver.
- **Step 2: Installing Windows Drivers**: Install Windows drivers on the host.
- **Step 3: Installing the Violin Utilities Package**: The Violin Utilities enable you to monitor and fine tune the performance of the Memory Array.

Before you can use the direct-attached Memory Array for data storage, you must first partition the drive. Create primary or extended partitions as needed by your application.

Installing Prerequisites

The first step towards installing the Windows drivers is to ensure that all of the required packages are installed on the Windows host prior to the installation and configuration of the Windows driver.

Two packages are required before installing the Memory Array Windows driver on the Windows host system:

- Install Service Pack 2 for Windows 2003 Server R2 with Microsoft patch KB932755. `http://support.microsoft.com/?kbid=932755`
- Change the Server 2008 SAN Disk Policy to `onlineall` in DiskPart for the Memory Array disk drive to auto-online after Windows driver removal/reinstall. For example:

```
DISKPART> san policy=onlineall
```

```
DiskPart successfully changed the SAN policy for the current
operation system.

DISKPART> exit
```

Installing Windows Drivers

The Windows Storport driver enables a direct-attached PCIe connection between a Memory Array and a Windows host machine.

The driver supports four direct-attached hosts running the following versions of the Windows operating system:

- Windows 7 x64
- Windows 2008 R2 Server (all editions) x64
- Windows 2008 SP2 Server (all editions) x86 and x64
- Windows 2003 R2 SP2, x86 and x64

For Windows Server 2008 R2, this Storport driver is WHQL certified.

Note: The procedures and examples provided in this chapter were created using a Windows Server 2008 host computer. If you are using a different version of Windows, your installation procedure may be different.

This section contains the following topics:

- Installing the Windows Drivers on page 137
- Manually Installing the Windows Drivers on page 141
- Removing the Windows Drivers on page 143

Installing the Windows Drivers

To install the Windows driver:

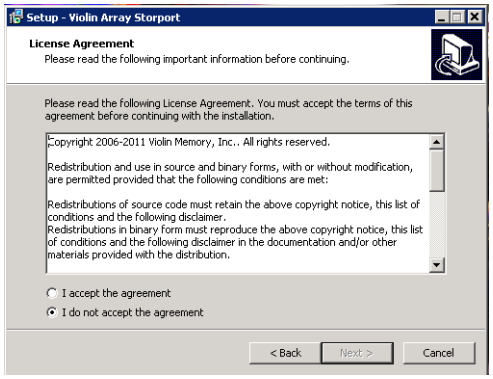
1. Log into the host as `administrator`.
2. Download the Windows driver zip file (`driver-storport-Dx.x.x.zip`) from the HP Support page.
3. Extract the contents of the zipped file to a suitable location on the host.
4. Run `setup.exe` from the `driver-storport-xxx` folder.

The Welcome to the Violin Array Storport Setup Wizard window appears.

Setup - Violin Array Storport
Welcome to the Violin Array Storport Setup Wizard
This will install Violin Memory Array Storport 4.5.3.0 on your computer.
It is recommended that you close all other applications before continuing.
Click Next to continue, or Cancel to exit Setup.
Violin MEMORY
Next >
Cancel

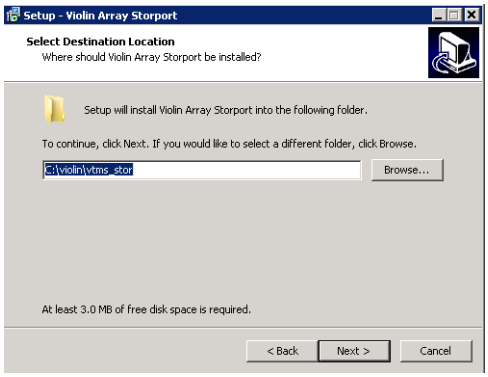
5. Click the Next button.

   The License Agreement window appears.


Setup - Violin Array Storport
License Agreement
Please read the following important information before continuing.
Please read the following License Agreement. You must accept the terms of this agreement before continuing with the installation.
Copyright 2006-2011 Violin Memory, Inc.. All rights reserved.
Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
I accept the agreement
I do not accept the agreement
< Back
Next >
Cancel

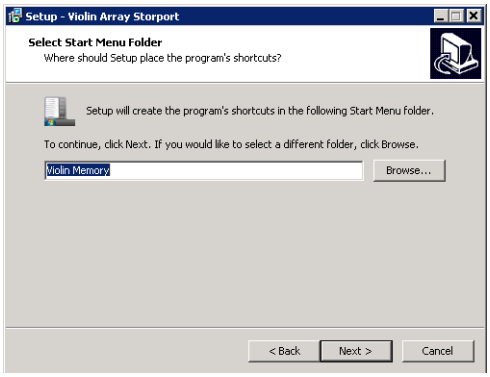
6. Select the I Accept the Agreement option and click the Next button.

   The Select Destination Location window appears.


Setup - Violin Array Storport
Select Destination Location
Where should Violin Array Storport be installed?
Setup will install Violin Array Storport into the following folder.
To continue, click Next. If you would like to select a different folder, click Browse.
C:\violin\vtms_stor
Browse...
At least 3.0 MB of free disk space is required.
< Back
Next >
Cancel

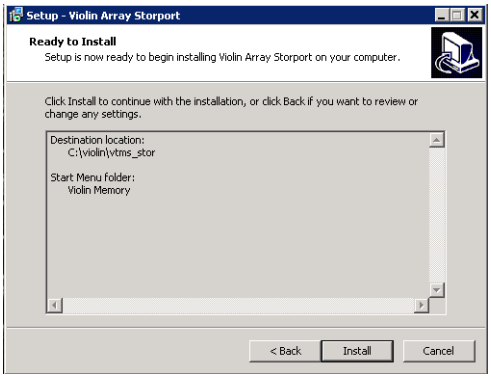
7. To change the destination folder, click the Browse button and navigate to the desired location otherwise do nothing to accept the default directory. Click the Next button.

   The Select Start Menu Folder window appears.


Setup - Violin Array Storport
Select Start Menu Folder
Where should Setup place the program's shortcuts?
Setup will create the program's shortcuts in the following Start Menu folder.
To continue, click Next. If you would like to select a different folder, click Browse.
Violin Memory
Browse...
< Back
Next >
Cancel

8. To change the destination folder, click the Browse button and navigate to the desired location. Click the Next button.

   The Ready to Install window appears.


Setup - Violin Array Storport
Ready to Install
Setup is now ready to begin installing Violin Array Storport on your computer.
Click Install to continue with the installation, or click Back if you want to review or change any settings.
Destination location:
C:\violin\vtms_stor
Start Menu folder:
Violin Memory
< Back
Install
Cancel

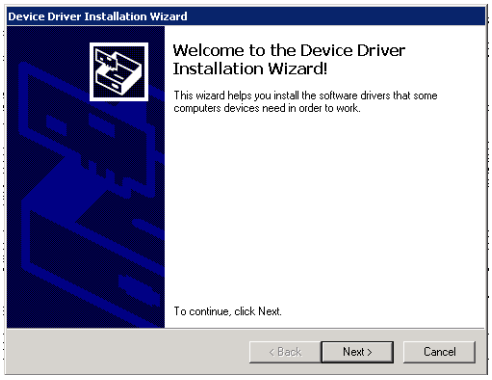
9. Click the Install button.

The Completing the Violin Array Storport Setup Wizard window appears.

Setup - Violin Array Storport
Completing the Violin Array Storport Setup Wizard
Setup has finished installing Violin Array Storport on your computer. The application may be launched by selecting the installed icons.
Click Finish to exit Setup.
View README.TXT
Scan / Configure Violin Devices
Violin
MEMORY
Finish

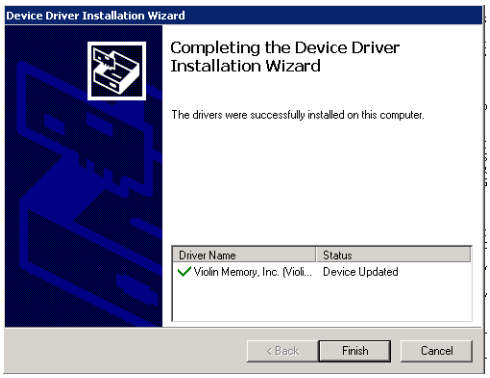
10. To view the readme file, select the View README.TXT check box.
11. Click the Finish button.

The Welcome to the Device Driver Installation Wizard window appears.


Device Driver Installation Wizard
Welcome to the Device Driver Installation Wizard!
This wizard helps you install the software drivers that some computers devices need in order to work.
To continue, click Next.
< Back
Next >
Cancel

12. Click the Next button.

The Completing the Device Driver Installation Wizard window appears.



13. Click the Finish button.
14. Reboot the host.
15. Log into the host as `administrator`.

    The Found New Hardware window appears, The window verifies that the Memory Array is properly connected to the host and is ready to be configured.

16. Select the No, Not This Time option and proceed with the installation of the Windows device driver.

    For step-by-step instructions, see Installing the Violin Utilities on page 144.

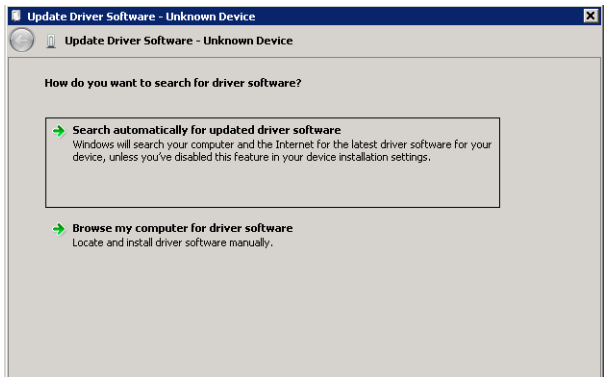
Manually Installing the Windows Drivers

To manually install the Storeport driver:

1. Log into the host as `administrator`.
2. Download the Windows driver zip file (`driver-storport-Dx.x.x.zip`) from the HP Support page.
3. Save the zipped file to a suitable location on the host. Do not extract the files.
4. Open the Device Manager.

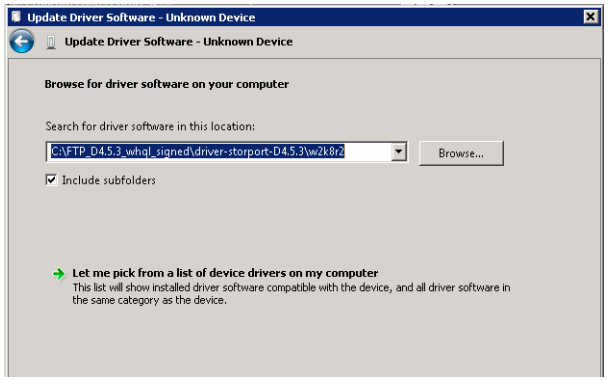
5. Right-click the Unknown Device icon in the Other Devices node and select the Update Driver Software option in the shortcut menu.

The Update Driver Software: Unknown Device window appears.


Update Driver Software - Unknown Device
Update Driver Software - Unknown Device
How do you want to search for driver software?
Search automatically for updated driver software
Windows will search your computer and the Internet for the latest driver software for your device, unless you've disabled this feature in your device installation settings.
Browse my computer for driver software
Locate and install driver software manually.

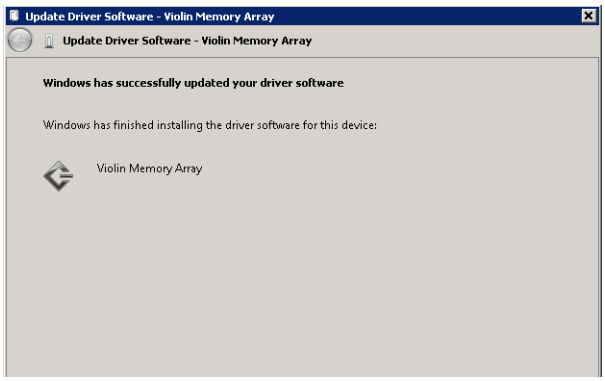
6. Select the Browse My Computer for Driver Software option.

   The Browse for Driver Software On Your Computer window appears.


Update Driver Software - Unknown Device
Update Driver Software - Unknown Device
Browse for driver software on your computer
Search for driver software in this location:
C:\FTP_D4.5.3_whql_signed\driver-storport-D4.5.3\w2k8r2
Browse...
Include subfolders
Let me pick from a list of device drivers on my computer
This list will show installed driver software compatible with the device, and all driver software in the same category as the device.

7. Click the Browse button and navigate to the directory where you saved the zipped file (`driver-storport-Dx.x.x.zip`).
8. Ensure that the Include Subfolders option is selected and click the OK button.

The Windows system installs the drivers. A confirmation dialog box confirms that the driver was correctly installed.


Update Driver Software - Violin Memory Array
Update Driver Software - Violin Memory Array
Windows has successfully updated your driver software
Windows has finished installing the driver software for this device:
Violin Memory Array

9. Reboot the host.
10. Log into the host as `administrator`.

    The Found New Hardware window appears, The window verifies that the Memory Array is properly connected to the host and is ready to be configured.

11. Select the No, Not This Time option and proceed with the installation of the Windows device driver.

    For step-by-step instructions, see Installing the Violin Utilities on page 144.

Verifying Host Computer Connections

1. After installing the Windows Storport driver and rebooting the system, log into the host as `administrator`.

   The Found New Hardware window appears. The window verifies that the Memory Array is properly connected to the host and is ready to be configured.

2. Select the No, Not This Time option and proceed with the installation of the Windows device driver.

   For step-by-step instructions, see Installing the Violin Utilities on page 144.

Removing the Windows Drivers

1. Log into the host as `administrator`.
2. Open the Control Panel.

3. Select Add or Remove Programs.

   The Uninstall or Change a Program manager appears.

4. Double-click the Violin Memory Array Storport program in the list.

   The Violin Array Storport Uninstall dialog box appears.

5. To delete the driver, click the Yes button.

   The Violin Array Storport Uninstall dialog box appears. You must restart the Windows host to complete the uninstall.

To restart the host, click the Yes button.

Installing the Violin Utilities

The third step in the installation of the Windows Storport driver and Violin Utilities is to install the Violin Utilities package (`driver-utils-Dx.x.x.zip`) itself.

In a direct-attached configuration, the Violin Utilities are installed on the host machine and may be used to view valuable information about the driver and the performance of the Memory Array system.

The Violin Utilities package includes the following tools.

Table 8.1 Command Line Utilities for Displaying Windows Driver Information

Utility	Description
`perf_test`	A multi-threaded AIO-capable disk benchmark utility.
`vcounts`	Display Memory Array I/O counters.
`veeprom`	Display main board serial number, management MAC address, etc., information.
`vinfo`	Display driver version and registry tunable parameters.
`vstat`	Display Memory Array status information.
`vupdate_tz`	Synchronize time zone data from host to the Memory Array for time correlation of Memory Array system logged events. If this command is not used, then All times are GMT based. Host time synch to the Memory Array will not occur until 15 minutes after driver load time.

Table 8.1 Command Line Utilities for Displaying Windows Driver Information

Utility	Description
`vzero`	Reset Memory Array I/O counters to zero.
`vincident`	The `vincident` script collects useful information from the host servers and Memory Array such as the version/ timestamp of the current kernel, CPU information, partition information, Memory Array configuration, and Memory Array logs.

These tools are used extensively during Phase 5: Performance Tuning and Testing of a Memory Array deployment as well as in general monitoring and maintenance. For instructions on using these tools, see Violin Utilities on page 149 and Performance Tuning and Troubleshooting on page 167.

- Installing the Violin Utilities on page 145
- Verifying Devices Are Attached As SCSI Devices on page 147
- Removing the Violin Utilities on page 148

Installing the Violin Utilities

To install the Violin Utilities:

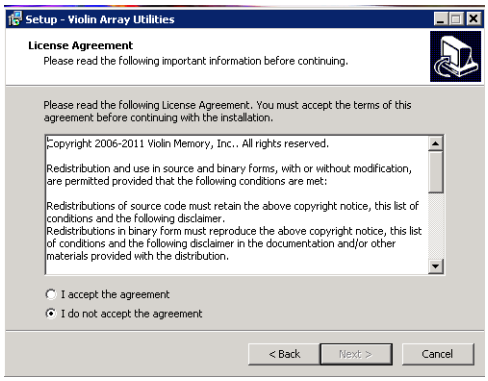
1. Log into the host as `administrator`.
2. Download the appropriate Violin Utilities zip file (`driver-utils-Dx.x.x.zip`) from the HP Support page.
3. Extract the contents of the zipped file to a suitable location on the host.
4. Run the `setup.exe` file from the `utils-xxx` folder.

   The Welcome to the Violin Array Utilities Setup Wizard window appears.

Setup - Violin Array Utilities
Welcome to the Violin Array Utilities Setup Wizard
This will install Violin Array Utilities 4.5.3.0 on your computer.
It is recommended that you close all other applications before continuing.
Click Next to continue, or Cancel to exit Setup.
Violin
MEMORY
Next >
Cancel

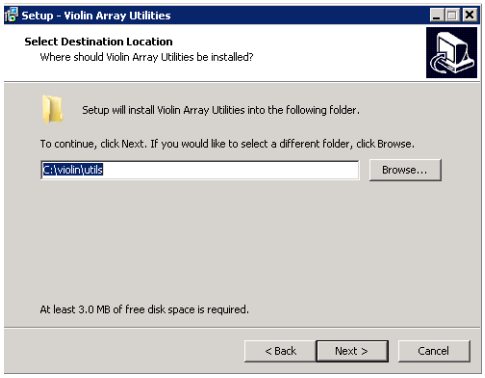
5. Click the Next button.

The License Agreement window appears.


Setup - Violin Array Utilities
License Agreement
Please read the following important information before continuing.
Please read the following License Agreement. You must accept the terms of this agreement before continuing with the installation.
Copyright 2006-2011 Violin Memory, Inc.. All rights reserved.
Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
I accept the agreement
I do not accept the agreement
< Back
Next >
Cancel

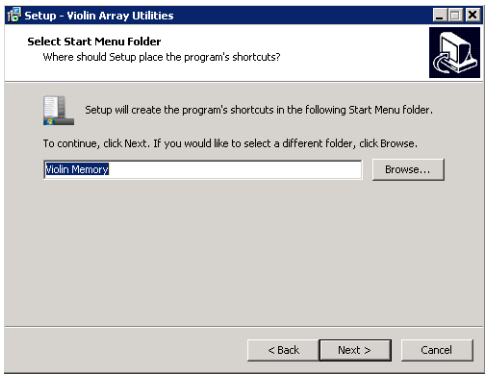
6. Select the I Accept the Agreement option and click the Next button.

   The Select Destination Location window appears.


Setup - Violin Array Utilities
Select Destination Location
Where should Violin Array Utilities be installed?
Setup will install Violin Array Utilities into the following folder.
To continue, click Next. If you would like to select a different folder, click Browse.
C:\violin\utils
Browse...
At least 3.0 MB of free disk space is required.
< Back
Next >
Cancel

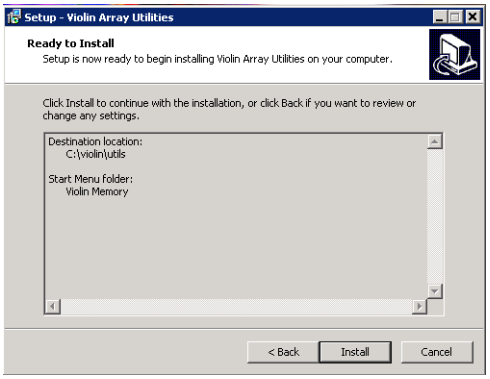
7. To change the destination folder, click the Browse button and navigate to the desired location otherwise do nothing to accept the default directory. Click the Next button.

   The Select Start Menu Folder window appears.


Setup - Violin Array Utilities
Select Start Menu Folder
Where should Setup place the program's shortcuts?
Setup will create the program's shortcuts in the following Start Menu folder.
To continue, click Next. If you would like to select a different folder, click Browse.
Violin Memory
Browse...
< Back
Next >
Cancel

8. To change the destination folder, click the Browse button and navigate to the desired location. Click the Next button.

   The Ready to Install window appears.


Setup - Violin Array Utilities
Ready to Install
Setup is now ready to begin installing Violin Array Utilities on your computer.
Click Install to continue with the installation, or click Back if you want to review or change any settings.
Destination location:
C:\violin\utils
Start Menu folder:
Violin Memory
< Back
Install
Cancel

9. Click the Install button.

   The Completing the Violin Array Storport Setup Wizard window appears.

Setup - Violin Array Utilities
Completing the Violin Array Utilities Setup Wizard
Setup has finished installing Violin Array Utilities on your computer. The application may be launched by selecting the installed icons.
Click Finish to exit Setup.
Violin
MEMORY
Finish

10. Click the Finish button.
11. Reboot the host.

A desktop icon is created to the Violin Utilities cmd shell.

Verifying Devices Are Attached As SCSI Devices

To verify that the system is connected as a SCSI device:

1. Log into the host as `administrator`.
2. Open the Device Manager.

Expand the Disk Drives node to view the Memory Array SCSI Disk Device.

Removing the Violin Utilities

1. Log into the host as `administrator`.
2. Open the Control Panel and click Add or Remove Programs.

   The Uninstall or Change a Program manager appears.

3. Double-click the Violin Array Utilities program in the list.

   The Violin Array Utilities Uninstall confirmation dialog box appears.

4. To delete the Violin Utilities, click the Yes button.

A dialog box appears confirming that the Violin Utilities have been deleted.

CHAPTER 9 Violin Utilities

This chapter describes the Violin Utilities used for configuring and performance testing the Memory Array system. These commands are common to the Linux and Windows drivers and to the Memory Gateway.

- Understanding the Violin Utilities on page 150
- Violin Utilities Reference on page 150

Understanding the Violin Utilities

The Violin Utilities are tools designed to enable you to monitor the performance of Memory Array systems in a direct-attached configuration.

Using the Violin Utilities, you may retrieve detailed information about the Memory Array and data transfer counts that enable you to configure the system for optimal performance.

Installing the Violin Utilities

The Violin Utilities may be installed on the Linux or Windows host in the course of installing the device drivers during Phase 3 of a direct-attached Memory Array deployment.

- For information on installing the Violin Utilities on a Linux host, see Installing the Violin Utilities on page 150.
- For information on installing the Violin Utilities on a Windows host, see Installing the Windows Drivers on page 137.

Running the Violin Utilities

As with any command that modifies the configuration of the Memory Array system, Violin Utilities commands must be issued as the `root` user on a Linux computer or as an `Administrator` on a Windows computer.

In each Violin Utilities command, specify the optional device index (`[<device_index>]`) to list the information for a particular Memory Array. If you do not specify an individual device, the command lists the information for all Memory Arrays found.

Running the Violin Utilities on a Linux Host

The Violin Utilities are run on the Linux host from the command line.

Running the Violin Utilities on a Windows Host

A shortcut icon is created on the Windows desktop to the Violin Utilities command shell when you install the Violin Utilities on the Windows host.

If you are not logged on as an `Administrator`, right-click the icon and select Run As Administrator to open the shell with the proper permissions.

Violin Utilities Reference

This section documents the syntax and usage of the following Violin Utilities.

- vcounts on page 151
- veeprom on page 153
- vhelp on page 155
- vincident on page 155
- vinfo on page 156
- vpartial on page 158
- vring on page 159
- vstat on page 160
- vupdate_tz on page 162
- vzero on page 163
- perf_test on page 163

vcounts

The `vcounts` utility displays data transfer counters for the Memory Array.

Syntax

```
vcounts [ <device_index> ]
```

Example

The `vcounts` utility returns information similar to the following when run on a Linux host:

```
# vcounts
Violin Memory, Inc.
Version: vtms-linux-utils-D4.5.4, 05/23/2011

Device:       vtmsa
Index:        0

-- Target Counts --
IRQ calls:                2
IRQ calls for V1010:      2
IRQ calls for errors:     0
Completed I/O bytes:      0
Completed read bytes:     0
Completed write bytes:    0
Completed I/O's:          0
Completed read I/O's:     0
Completed write I/O's:    0
Failed read I/O's:        0
Failed write I/O's:       0
Average read bytes:       0
Average write bytes:      0
```

```
Unaligned host buf reads:  0
Unaligned host buf writes: 0
Requested DMA reads:       0
Requested DMA writes:      0
Flash partial page reads:  0
Flash partial page writes: 0
```

Returns

The `vcounts` utility returns the following counters:

`IRQ calls`	The total interrupt request handler calls to the Memory Array device driver.
`IRQ calls for V1010`	The total calls to the Memory Array device driver where work was done.
`IRQ calls for errors`	The total of DMA errors returned as well as PCIe link loss errors.
`Completed I/O bytes`	The total bytes read/written from/to a Memory Array.
`Completed read bytes`	The total bytes read from the Memory Array.
`Completed write bytes`	The total bytes written to a Memory Array.
`Completed I/O's`	The total I/O read / write requests from and to Memory Array. This is not the individual DMA descriptors completed, but for each of the user requested I/Os.
`Completed read I/O's`	The total I/O read requests from a Memory Array. This is not the individual DMA descriptors completed, but for each of the user requested I/Os.
`Completed write I/O's`	The total I/O write requests to a Memory Array. This is not the individual DMA descriptors completed, but for each of the user requested I/Os.
`Failed read I/O's`	The total failed I/O read requests from a Memory Array. This is not the individual DMA descriptors failed, but for each of the user requested I/Os.
`Failed write I/O's`	The total failed I/O write requests to a Memory Array. This is not the individual DMA descriptors failed, but for each of the user requested I/Os.
`Average read bytes`	The rough average of read I/O request sizes.
`Average write bytes`	The rough average of write I/O request sizes.

`Unaligned host buf reads`	The total I/O read requests from a Memory Array, but only incremented when an unaligned host address required special buffer byte copying to service the DMA request.
`Unaligned host buf writes`	The total I/O write requests to a Memory Array, but only incremented when an unaligned host address required special buffer byte copying to service the DMA request.
`Requested DMA reads`	Incremented for each read DMA descriptor added to the descriptor ring. A single I/O may result in multiple DMA descriptors to complete a single I/O request.
`Requested DMA writes`	Incremented for each write DMA descriptor added to the descriptor ring. Note that a single I/O may result in multiple DMA descriptors to complete a single I/O request.
`Flash partial page reads`	Incremented when a DMA descriptor for read is less than a flash page (4kB) in size. On a DRAM-based system, this will always be 0.
`Flash partial page writes`	Incremented when a DMA descriptor for write is less than a flash page (4kB) in size which leads to a hardware Read-Modify-Write operation.

veeprom

The `veeprom` utility displays the Memory Array hardware information such as the main board serial number, MAC address of the management interface, and so on.

Syntax

```
veeprom [ <device_index> ]
```

Windows Example

The `veeprom` utility returns information similar to the following example when run on a Windows host:

```
C:\violin\utils> veeprom
Violin Memory, Inc.
Version: vtms-win-utils, <date>

Device:  \\.\scsi5:
Index:   0

-- EEPROM info --
Part #    : 1000074S-C-08
Serial #  : 6C057CWX00134
Board Ver : 0
Mfg. Date : 20071226
Mgmt. MAC : 00:1b:97:00:00:86
```

The Windows example returns the following information.

`Part #`	Displays the part number of the main board.
`Serial #`	Displays the serial number of the main board.
`Board Ver`	Displays the version of the main board.
`Mfg. Date`	Indicates the manufacturing date of the main board.
`Mgmt. MAC`	Displays the MAC address of the management interface.

Linux Example

The `veeprom` utility returns information similar to the following example when run on a Linux host:

```
# veeprom
Violin Memory, Inc.
Version: vtms-linux-utils-D4.5.4, 05/23/2011

Device:       /dev/vtmsa
Index:        0

-- EEPROM info --
ee_version:   1
ee_partnum:   1000074S-C-08
ee_serialnum: 1609CR00000272
ee_boardver:  0
ee_mfgdate:   20100216
ee_mgmtmac:   00:1b:97:00:01:10
```

The Linux example returns the following information.

`ee_version`	Displays the EEPROM data format version.
`ee_partnum`	Displays the part number of the main board.
`ee_serialnum`	Displays the serial number of the main board.
`ee_boardver`	Displays the version of the main board.
`ee_mfgdate`	Indicates the manufacturing date of the main board.
`ee_mgmtmac`	Displays the MAC address of the management interface.

vhelp

The `vhelp` utility displays a help text file that shows the common Memory Array utilities and online descriptions for each available utility.

Syntax

```
vhelp
```

vincident

The `vincident` script collects useful information from the host servers and array such as version/timestamp of the current kernel, CPU information, partition information, Memory Array configuration, and Memory Array logs.

Once collected, this information can be sent to HP Customer Support for analysis to determine the source of performance issues, such as ECC errors.

The `vincident` script is installed on the host server as part of the Violin Utilities package. For more information, see Installing the Violin Utilities on page 150 for Linux hosts, or Installing the Violin Utilities on page 150 for Windows hosts.

Syntax

```
vincident { <tty_device> | <ip_address> } [--max-timeout
secs]
```

`vincident` may be run using the IP address of the Memory Array (`<ip_address>`) or using a serial cable connected from the host server to the Memory Array (`<tty_device>`).

The vincident utility creates an incident report in the current directory with a name similar to `vincident.20110624T110149`.

You must log in as `root` on the Linux host computer to run the `vincident` reporting script. In the event that the full path name of the `vincident` utility is not in the `root PATH`, the full path of `vincident` is `/opt/violin/bin/vincident`.

Example

```
# vincident 10.1.10.123
Gathering information from host...
Gathering information from target...
Incident report created in vincident.20110624T110149
```

vinfo

The `vinfo` utility displays the Memory Array type and version.

Syntax

```
vinfo [ <device_index> ]
```

Example

The `vinfo` utility returns information similar to the following example when run on a Windows host:

```
C:\violin\utils> vinfo
Violin Memory, Inc.
Version: vtms-win-utils, <date>

Device:  \\.\scsi5:
Index:   0
Disk:    \\.\physicaldrive1

-- Target Info --
Host Driver:  vtms-win-storport-f-path-14643-dirty
Driver Date: <date> 16:05:24
Target S/W:   <release>
Memory:       206158430208 bytes
Memory Type:  6GB DRAM VIMMs
RAID groups:  8 (40-VIMM)
Granularity:  512 bytes
RingSize:     4096
IrqTune:      0x80
IoTimeout:    30
NoMSI:        0
Debug:        0x0
Serial #:     6B0977WX00108
Mgmt. MAC:    00:1b:97:00:00:6c
```

Returns

The `vinfo` utility returns the following information.

`Host Driver`	Displays the host system vtms device driver version.
`Driver Date`	Displays block mode only. When set to 1, allows READA read-ahead I/Os to be accepted.
`Target S/W`	Displays the software / firmware version running on Memory Array.
`Memory`	Displays the size in bytes of usable system capacity. For flash VIMMs, this value changes based on formatted capacity.
`Memory Type`	Displays the size and type of populated VIMMs.
`RAID groups`	Displays the number of 5-VIMM RAID groups. Spare VIMMs are not counted.
`Granularity`	Displays the smallest access granularity for I/O request in bytes.
`RingSize`	Displays the size of driver DMA descriptor ring per Memory Array. Must be power of 2 with range of 2 - 4096.
`IrqTune`	Displays the Interrupt combining tunable with `0` = disabled and `4095` being the highest value.
`IoTimeout`	Displays the time in seconds before the device driver declares an I/O as stuck and disables Memory Array I/O access. `0` = disables timeout.
`NoMSI`	When set to `1`, specifies that the driver will not attempt to allocate a PCIe MSI-based interrupt vector.
`Debug`	Displays the current value of driver debug mask. `0` = no debug messages.
`Serial #`	Displays the Memory Array serial number stored on its EEPROM and also shown on the label on the back of the unit.
`Mgmt. MAC`	Displays the Memory Array Ethernet port MAC address, useful for adding into a DHCP server configuration file.

vpartial

The `vpartial` utility displays the number of read/write I/O requests processed and the number of partial 4kB flash pages.

Syntax

```
vpartial  [ <device_index> ]
```

Example

The `vpartial` utility returns information similar to the following example when run on a Linux host:

```
# vpartial
Violin Memory, Inc.
Version: vtms-linux-utils-D4.5.4, 05/23/2011

Device:       vtmsa
Index:        0

-- Target Unaligned / Partial Counts --
Completed read I/O's:      1995280246
Unaligned host buf reads:  0
Flash partial page reads:  10326

Completed write I/O's:     1903433508
Unaligned host buf writes: 0
Flash partial page writes: 4535553
```

Returns

The `vpartial` utility returns the following information.

`Completed read I/O's`	Displays the total I/O read requests from a Memory Array. This is not the individual DMA descriptors completed, but for each of the user requested I/Os.
`Unaligned host buf reads`	Displays the total I/O read requests from a Memory Array, but only incremented when an unaligned host address required special buffer byte copying to service the DMA request.
`Flash partial page reads`	Incremented when a DMA descriptor for read is less than a flash page (4kB) in size.

`Completed write I/O's`	Displays the total I/O write requests to a Memory Array. This is not the individual DMA descriptors completed, but for each of the user requested I/Os.
`Unaligned host buf writes`	Displays the total I/O write requests to a Memory Array, but only incremented when an unaligned host address required special buffer byte copying to service the DMA request.
`Flash partial page writes`	Increments when a DMA descriptor for write is less than a flash page (4kB) in size, which leads to a hardware read-modify-write operation.

vring

The `vring` utility debugs the internal Memory Array I/O request ring at a low level, and checks for unaligned flash device access.

Look for the transfer sizes under the column labeled `SIZE`. If most of the lines show `4096`, full 4kB accesses are being done to the Memory Array hardware, which is optimal. In an unaligned access case, you will see lines alternate between 512 and 3584 for transfer size, since two read-modify-write operations occur for each 4kB of data.

Syntax

```
vring [ -p <partition_name> ]
```

Parameters

Table 9.1 vring Utility Parameters

Parameter	Description
`-p`	Specifies that a partition is to be selected.
`<partition_name>`	Specifies the name of the partition.

Example

The `vring` utility returns information similar to the following example when run on a Linux host:

```
# vring
Violin Memory, Inc.
Version: vtms-linux-utils-D4.5.4, 05/23/2011

INDX CMD/FLAGS  TRGT_ADDR           HOST_ADDR           SIZE
   0 0x00000000 0x0000001b32acc000  0x0000000044736000  4096
   1 0x00000000 0x0000001b32acd000  0x0000000063e77000  4096
   2 0x00000000 0x0000001b32ace000  0x0000000022bb8000  4096
   3 0x00020000 0x0000001b32acf000  0x0000000079639000  4096
   4 0x01020000 0x00000033eb48c000  0x00000000865bb000  4096
...
```

vstat

The `vstat` utility displays the status of the connection and the ready status of a Memory Array.

Syntax

```
vstat [ <device_index> ]
```

Example

The `vstat` utility returns information similar to the following example when run on a Linux host:

```
# vstat
Violin Memory, Inc.
Version: vtms-linux-utils-D4.5.4, 05/23/2011
Device:       vtmsa
Index:        0

-- Target Status --
Status LED:   ON
Alarm  LED:   OFF
PWR_A  LED:   ON
PWR_B  LED:   OFF
ready:        1
formatting:   0
format_done:  0

paused:       0
link:         1
lid_ajar:     0
raid_rebuild: 0
write_buffer: 1
linkwidth:    8
maxlinkwidth: 8
cur_payload:  128
max_payload:  1024
cur_read_req: 512
dma_active:   569
io_pend:      525
```

Returns

The `vstat` utility returns the following information.

`Status LED`	Indicates whether the Status LED is on or not.
`Alarm LED`	Indicates whether the Alarm LED is on or not. If it is on, it indicates the status of the LED flashing.
`PWR_A LED`	Indicates whether the Power A LED is on or not.
`PWR_B LED`	Indicates whether the Power B LED is on or not.

`ready`	Indicates whether the data plane is online and ready or offline.
`formatting`	Indicates if formatting of the VIMMs is in progress or not. This is only applicable to flash VIMM systems.
`format_done`	Indicates the progress percentage done during formatting of the VIMMs.
`paused`	Indicates the pause interval for I/Os.
`link`	Indicates whether the PCIe connection is online or offline.
`lid_ajar`	Indicates whether the lid is closed or not.
`raid_rebuild`	Indicates the status of a RAID group rebuild.
`write_buffer`	Indicates whether flash write buffering is enabled or disabled.
`linkwidth`	Indicates how many active PCIe lanes are available.
`maxlinkwidth`	Indicates the maximum number of active PCIe lanes.
`cur_payload`	Indicates the size of the PCIe payload.
`max_payload`	Indicates the maximum size of the PCIe payload.
`cur_read_req`	Indicates the size of the PCIe read requests.
`dma_active`	Indicates the number of 4kB DMA descriptors actively being processed by Memory Array hardware.
`io_pend`	Indicates the number of I/O requests in the queue for a Memory Array. A single I/O request may involve more than one 4kB DMA descriptor.

vupdate_tz

The `vupdate_tz` utility updates the time zone in which the Memory Array is located, and displays the time zone offset in seconds.

This utility is set to run as a cron job once a day and on boot up of the Memory Array.

Syntax

```
vupdate_tz
```

Example

The `vupdate_tz` utility returns information similar to the following example when run on a Linux host:

```
# vupdate_tz
Violin Memory, Inc.
Version: vtms-linux-utils-D4.5.4, 05/23/2011

tz_secs=28800 tz_altsecs=25200 tz_minwest=420 tm_isdst=1
```

The output shows that this Memory Array is 300 minutes (5 hours) from GMT.

vzero

The `vzero` utility resets the I/O counters to zero.

Syntax

```
vzero [ <device_index> ]
```

Example

The `vzero` utility returns information similar to the following example when run on a Linux host:

```
# vzero
Violin Memory, Inc.
Version: vtms-linux-utils-D4.5.4, 05/23/2011

Zeroed counters for V1010 index 0
Zeroed counters for V1010 index 1
```

perf_test

The `perf_test` utility is a lightweight yet powerful tool for measuring the I/O performance of storage devices.

This utility is designed to push the I/O device as hard as possible by a variety of methods including POSIX threads, variable block sizing, asynchronous I/O, direct communication, as well as sequential and random read/ write operations to data over a user-defined address range.

Syntax

```
perf_test
```

For a discussion of using the `perf_test` utility in Memory Array performance tuning, see Performance Testing Using perf_test on page 174.

Options

The `perf_test` utility has the following options:

Table 9.2 perf_test Utility Options

Option	Description
`-h | -?`	Displays help.
`-b block-size`	Sets the size of each block, in bytes, such as 128, 512, 1024, and so on. Recognized unit/size qualifiers include: `k` and `K` for the appropriate binary multipliers.
`-B [low,high[,step]]`	Specifies range of blocks.
`-r read-weight`	Specifies the read weight, relative to the write weight. Specify `0` to not do any reads at all.
`-w write-weight`	Specifies the write weight, relative to the read weight. Specify `0` to not do any writes at all.
`-s memory-size`	Specifies the system memory size, in GB (if no units are provided). Recognized unit/size qualifiers include: `k`, `K`, `m`, `M`, `g` and `G` for the appropriate binary multipliers.
`-d duration`	Specifies the duration of the test, in seconds, before terminating. Not specifying the duration, or specifying `0`, allows `perf_test` to run indefinitely.
`-p device-path`	Specifies the path to device, such as `/dev/sda`, and `/dev/vtmsa`.
`-t num-threads`	Specifies the number of threads to invoke. Each thread is governed by the options specified for reads, writes, verification, block size, and so on, and operates independently in terms of randomness of addresses touched.

Table 9.2 perf_test Utility Options *(Continued)*

Option	Description
`-A async-io-depth`	Specifies the number of I/Os to generate using the operating system's asynchronous I/O API. On Linux, this option is only available if the `libaio` and `libaio-devel` packages were installed with the Violin Utilities installation. Specify less threads using the `-t` option for Windows and Linux drivers and specify more asynchronous I/Os using the `-A` option, as it reduces CPU context switching.
`-a address`	Specifies the address, in hex, where read/write operations occur or start. Useful with the `-C` option for sequential reads and writes.
`-c char`	Specifies a character, in hex, to write when performing write operations. Example: `0xCA`.
`-V`	Verifies writes with a read to ensure data integrity. This option can have a significant impact on overall I/O throughput.
`-I`	Ignores errors on read/write operations to the device.
`-R`	Selects addresses to read/write randomly.
`-C`	Selects addresses to read/write incrementing by the block size specified.
`-q`	Specifies quiet mode. Prints a summary of information only just before exiting and not every second. This option is useful when using `perf_test` in a scripted environment.
`-z`	Specifies print timestamps as real time instead of number of seconds elapsed since the start of the test.
`-L`	Specifies latency mode.
`-u`	Prints detailed system utilization statistics.
`-o`	Informs `perf_test` to bypass the buffer cache by using the `O_DIRECT` flag when opening a connection to the device-path. This option applies to block devices only and not character devices.

Example

By default, the `perf_test` accesses the first Memory Array device using a single thread for a repeated 4kB read of sector 0. For best results, use the `-R` option to randomly access a specific range (`-s`) using multiple threads (`-t`), direct I/Os (`-o`), and asynchronous I/Os (`-A`).

The `perf_test` utility returns information similar to the following example when run on a Linux host:

```
# perf_test -s 640 -R -A64 -t8 -o
Violin Memory, Inc.
Version: vtms-linux-utils-D4.5.4, 05/23/2011
Command: perf_test -s 640 -R -A64 -t8 -o

Running with options:
threads                 = 8
block_size              = 4096
memory size             = 640 GB
memory start addr       = 0x0

write:read ratio        = 0:1
random mode             = 1
duration                = 0 secs
path                    = /dev/vtms-strad
  MB                      = 1000000 bytes
  no-cache mode           = 1
  AIO depth               = 64

Time (sec)Read BW Write BWTotal BWRead IOPSWrite IOPSTotal IOPS

1    817.181 MB/s0.000 MB/s817.181 MB/s199507001995070
2    817.132 MB/s0.000 MB/s817.132 MB/s1994950199495
3    817.160 MB/s0.000 MB/s817.160 MB/s1995010199501
4    817.096 MB/s0.000 MB/s817.096 MB/s1994860199486
```

CHAPTER 10 Performance Tuning and Troubleshooting

This chapter provides an overview of Memory Array performance tuning and testing, describes flash-layer performance tuning, and network-layer performance testing techniques using the `perf_test` utility.

- Performance Tuning and Testing Overview on page 168
- Flash-Layer Performance Tuning on page 169
- Network-Layer Performance Testing on page 172

Performance Tuning and Testing Overview

One of the primary reasons for choosing a Memory Array for block storage is that a flash-based memory array enables you to extract maximum performance from your applications.

But optimal performance is achievable only if the entire Memory Array system is properly tuned. In many cases, the default settings provide for significant application acceleration. Where this is not the case, a careful review of the system defaults at each layer is recommended.

If any one layer is incorrectly sized or configured, the performance of the entire application will be limited by this bottleneck. In an HDD-based system, the physical disks are often an obvious performance bottleneck. In a flash-based memory array, application performance bottlenecks may occur at any one of six system layers;

- Flash-layer: The flash-based memory array configuration and attributes
- Network-layer: The PCIe cables, cards, and slots
- Host-layer: The processors, RAM, interconnects, and PCIe hubs
- Operating System-layer: The Linux or Windows operating system and its buffer and I/O settings
- File System-layer: The file system and its settings such as block size, snapshots, and logging
- Database-layer: The database (if used) and its configuration and optimizations

In general, performance tuning and testing is a six-step process by which each layer of the Memory Array system is tuned before moving on to the next layer in the system.

Performance tuning and testing techniques for the higher system levels are beyond the scope of this book. This chapter describes techniques for tuning and testing the first two layers in the Memory Array system: the flash layer and the network layer.

- **Step 1: Flash-layer performance tuning**: Ensure that the file system and operating system are 4kB aligned. The `vpartial` and `vring` Utilities enable you to identify 4kB alignment issues.
- **Step 2: Network-layer performance tuning and testing**: Network-layer performance testing may be done in two phases. First, ensure that all of the PCIe connections are high-bandwidth. Next, use the `perf_test` utility to establish performance baselines for reads, writes, and mixed reads and writes.

After the flash and network layers have been configured and tested, you may test the performance of the higher system layers.

While these tests are running, use operating system tools to confirm that actual I/O activity is similar to the levels tested using the `perf_test` utility. If the I/O is not similar to the baselines, then the operating system, file system, or database may need to be tuned. Please contact HP Customer Support for assistance if needed.

Flash-Layer Performance Tuning

In a Memory Array system, the performance of the flash layer is a function of several attributes of the flash-based memory arrays.

- Type of VIMM (SLC or MLC): SLC is faster for writes
- Number of VIMMs per Memory Array: 42/84 VIMMs are faster than 21 VIMMs
- Formatted Capacity: 65% format is faster than 84%
- Number of Memory Arrays: Like all storage media, more arrays provides higher bandwidth.

Flash-based memory arrays are designed for 4kB block access or any multiple of 4kB blocks. Smaller block sizes (e.g. 512 bytes) will significantly reduce performance, particularly for writes. Therefore, it is import that you verify whether the file system and operating system are 4kB aligned. For more information see Memory Array Flash 4kB Alignment on page 169.

Random workloads with high IOPS are well supported by flash memory. Unlike hard disk drives, sequential accesses are not significantly faster. For this reason, it is typically better that higher layers are tuned for 4kB-16kB block sizes and high IOPS.

Where an application needs very high bandwidth, multiple Memory Arrays are recommended.

Flash Memory Arrays achieve maximum performance when large numbers of flash devices are used simultaneously, which requires a large number of simultaneous accesses by the application and file system. Typically, this is enabled through asynchronous I/O and having many threads simultaneously access the flash memory. Where this is not the case, this is known as single-threaded access and severely limits performance.

Memory Array Flash 4kB Alignment

One major consideration for flash-based Memory Array system performance is the 4kB address alignment on I/O requests.

The most common indication that a partition that is out of alignment is poor performance; low read/write I/Os per second (IOPS). Partitions can easily be out of 4kB alignment because most operating systems, when creating a file

system, do so for traditional RAIDs and solid-state drives; that is, 63 sectors per track.

Two Utilities included in the Violin Utilities package, the `vpartial` utility and the `vring` utility, enable you to identify these issues.

This section describes how the Violin Utilities may be used to diagnose 4kB alignment issues and provides instructions for correcting these problems on Linux and Windows hosts.

- Checking Flash 4kB Alignment and Partial Pages on page 170
- Checking Flash 4kB Alignment and Request Ring on page 170
- Addressing 4kB Alignment Issues on Linux Hosts on page 171
- Addressing 4kB Alignment Issues on Windows Hosts on page 171

Checking Flash 4kB Alignment and Partial Pages

The `vpartial` utility shows the number of read/write I/O requests processed and partial 4kB flash pages.

```
# vpartial
Violin Memory, Inc.
Version: vtms-linux, <date>

Device:       vtmsa
Index:        0

-- Target Unaligned / Partial Counts --
Completed read I/O's:      1995280246
Unaligned host buf reads:  0
Flash partial page reads:  10326

Completed write I/O's:     1903433508
Unaligned host buf writes: 0
Flash partial page writes: 4535553
```

For more information on the `vpartial` utility, see vpartial on page 158.

Checking Flash 4kB Alignment and Request Ring

The `vring` utility debugs the internal Memory Array I/O request ring at a low level, and checks for unaligned flash device access.

Look for the transfer sizes under the column labeled `SIZE`. If most of the lines show `4096`, full 4kB accesses are being done to the Memory Array hardware, which is optimal. In an unaligned access case, you will see lines alternate

between 512 and 3584 for transfer size, since two Read-Modify-Write operations occur for each 4kB of data.

```
# vring
Violin Memory, Inc.
Version: vtms-linux-utils-D4.5.4, 05/23/2011

INDX CMD/FLAGS  TRGT_ADDR           HOST_ADDR           SIZE
   0 0x00000000 0x0000001b32acc000  0x0000000044736000  4096
   1 0x00000000 0x0000001b32acd000  0x0000000063e77000  4096
   2 0x00000000 0x0000001b32ace000  0x0000000022bb8000  4096
   3 0x00020000 0x0000001b32acf000  0x0000000079639000  4096
   4 0x01020000 0x00000033eb48c000  0x000000000865bb000  4096
...
```

The `vring` utility requires access to `/dev/vtms-strad`, which is a symbolic link to the first discovered Memory Array.

If more than one Memory Array is connected, the devices can be explicitly selected by using the partition 0 control device. For example, if the second Memory Array is `vtms1`, then the command is:

```
vring -p /dev/rdsk/vtms1v0
```

For more information on the `vring` utility, see vring on page 159.

Addressing 4kB Alignment Issues on Linux Hosts

On Linux systems, the `fdisk` utility with the `-S` option enables you to override the default geometry of 63 sectors per track and specify a different number of sectors for use by the partition tables.

Running `fdisk -S56` provides 4kB alignment automatically provides 4kB alignment on created partitions. For example,

```
fdisk -S56 /dev/vtmsa
```

Addressing 4kB Alignment Issues on Windows Hosts

Windows Server 2008 and Windows 7 Servers

Windows Server 2008 and Windows 7 operating systems automatically align.

Windows 2003 and Windows XP Servers

On Windows 2003 and Windows XP Servers 4kB addresses may be realigned using the `diskpart` hard disk partitioning utility.

1. If the disk you are aligning is already blank (raw), go to Step 3. If the disk contains data, back up the disk before proceeding.
2. Delete all partitions on the disk.
3. From the Windows 2003 Server, open a command prompt and run `Diskpart.exe`.
4. At the `diskpart` command prompt, type `List Disk` and press ENTER.

   If the disk you want to align does not appear in the list, make sure that it exists and is accessible using the Disk Management snap-in.

5. At the `diskpart` command prompt, type `Select Disk X`.

   Where `X` is the number of the disk as shown in the output of the `List Disk` command. The `diskpart` utility should return a message that indicates that `Disk X` is the selected disk.

6. At the `diskpart` command prompt, type `Create Partition Primary Align=64`.
7. At the `diskpart` command prompt, type `Assign Letter=<DriveLetter>`.
8. After the drive letter is assigned, type `exit` to exit the `diskpart` utility.
9. Use the Disk Management snap-in or the Format command to format the partition as an NTFS-formatted partition.

Note: When formatting, select an Allocation Unit Size that is a multiple of 4kBs.

Reference: Microsoft Technet article `http://technet.microsoft.com/en-us/library/aa998219.aspx`

Network-Layer Performance Testing

The second step in fine tuning a Memory Array is to test the performance of the network-layer.

Network-layer performance testing may be done in two phases. First, ensure that all of the PCIe connections are high-bandwidth. The Memory Array is designed to use either single PCIe x8 G1 or dual PCIe x4 G1 connections and will not perform optimally if insufficient provisioned.

Once you have confirmed that the PCIe connections are high bandwidth, use the `perf_test` utility to baseline the system by testing the read bandwidth, write bandwidth, and a mix of reads and writes against the expected block size of the application.

- Preliminary Network-Layer Checks on page 173

- Performance Testing Using perf_test on page 174

Preliminary Network-Layer Checks

The Memory Array is designed for high-bandwidth connections via either single PCIe x8 G1 or dual PCIe x4 G1.

Where the Memory Array is connected to the host, check the following factors to achieve the best possible performance from your Memory Array:

- PCIe Bridge Slot Sharing on page 173
- PCIe Slots Rated for x4 on page 173
- PCIe Payload on page 173

PCIe Bridge Slot Sharing

Many host systems share PCIe data lanes among two or more physical slots. Individually, a slot may be x8 electrically, but it may share those eight lanes with another slot or be restricted by an upstream PCIe switch.

In effect, the aggregate bandwidth when both slots are fully used would not be greater than x8 speeds. This can hinder each device to 50% of its capable bandwidth or worse. Be mindful of the PCIe slot routing for your host server to make the best use for IOPS and bandwidth.

PCIe Slots Rated for x4

Even though a PCIe slot connector may appear to physically support a x8 or even x16 card, the connected electrical lanes may only be x4. Many host servers have a mixture of PCIe slots available, such as x4 and x8. Check the data sheet for your host computer to make sure that the PCIe adapter card is plugged into a x8 electrically capable slot.

PCIe Payload

The maximum payload size configured for the host's PCIe adapter and the upstream PCIe bridge devices can limit bandwidth speeds.

Intel x86/x64 CPU-based systems generally can handle a payload size of 256-bytes. BIOS vendors often leave this configured to the default value of 128-bytes. Certain AMD64 servers can be configured to handle a payload as high as 512-bytes, depending on bridge chips used.

Testing has shown that a read bandwidth of 1.7 GB/s is achievable with a 512-byte PCIe payload, whereas a 128-byte payload might be limited to 1.2 GB/s. In some cases, upgrading a host server to the latest BIOS version will increase the default configured payload.

Performance Testing Using perf_test

The `perf_test` utility is a lightweight tool for measuring the I/O performance of storage devices.

The `perf_test` utility was specifically designed to push the I/O device as hard as possible using a variety of methods including POSIX threads, variable block sizing, asynchronous I/O, direct communication, as well as sequential and random read/ write operations to data over a user-defined address range.

This section describes the `perf_test` utility and shows how it may be used to test the performance of a direct-attached Memory Array system:

- Running the perf_test Utility on page 174
- Baselining the Memory Array System on page 176
- Testing Read Bandwidth on page 177
- Testing Write Bandwidth on page 177

Running the perf_test Utility

For best results, use the (`-R`) option to randomly access a specific range (`-s`) using multiple threads (`-t`), direct I/Os (`-o`), and asynchronous I/Os (`-A`).

For example, the command `perf_test -s 640 -R -A64 -t8 -o` returns the following example when run on a Linux host:

```
# perf_test -s 640 -R -A64 -t8 -o
Violin Memory, Inc.
Version: vtms-linux-utils-D4.5.4, 05/23/2011
Command: perf_test -s 640 -R -A64 -t8 -o

Running with options:
threads                 = 8
block_size              = 4096
memory size             = 640 GB
memory start addr       = 0x0
write:read ratio        = 0:1
random mode             = 1

 duration                = 0 secs
path                    = /dev/vtms-strad
  MB                      = 1000000 bytes
  no-cache mode           = 1
  AIO depth               = 64

Time(sec)Read BW Write BWTotal BWRead IOPSWrite IOPSTotal IOPS

1    817.181 MB/s0.000 MB/s817.181 MB/s1995070199507
```

```
2    817.132 MB/s0.000 MB/s817.132 MB/s1994950199495

3    817.160 MB/s0.000 MB/s817.160 MB/s1995010199501

4    817.096 MB/s0.000 MB/s817.096 MB/s1994860199486
```

The following table describes the options used in this command. For a complete list of `perf_test` utility options, is perf_test on page 163.

`-s memory-size`	Specifies the system memory size, in GB (if no units are provided). Recognized unit/size qualifiers include: `k`, `K`, `m`, `M`, `g` and `G` for the appropriate binary multipliers.
`-t num-threads`	Specifies the number of threads to invoke. Each thread is governed by the options specified for reads, writes, verification, block size, and so on, and operates independently in terms of randomness of addresses touched.
`-R`	Selects addresses to read/write randomly.
`-o`	Informs `perf_test` to bypass the buffer cache by using the `O_DIRECT` flag when opening a connection to the device-path. This option applies to block devices only and not character devices.
`-A async-io-depth`	Specifies the number of I/Os to generate using the operating system's asynchronous I/O API.

For best results, take the following factors into consideration when running the `perf_test` utility.

Memory Access Patterns

The `perf_test` memory access modes include random, sequential, and single-address. Accessing just a single address can radically impact the performance a device can deliver, as can sequential and random access. So, know which address access mode is being used when running tests.

Threading and Asynchronous I/O

Use `perf_test` to specify the number of threads to spawn and the number of outstanding I/Os within each request.

The Linux operating system tends to deal with larger asynchronous I/O depths better than a larger number of threads. High amounts of I/O can be achieved by understanding the operating system behavior and using a combination of thread counts and asynchronous I/O.

Block Size

Consider the block size when testing for maximal bandwidth versus maximal IOPS. Use a larger block size (megabytes, if necessary) when evaluating bandwidth performance and smaller block sizes, such as 4kB, when evaluating a device's maximum IOPS potential.

Latency

Use `perf_test` to measure round-trip latency of an I/O request. Generally, latency measurements should only be made using one thread and an asynchronous I/O depth of one. Any other values skew the latency measurements.

Direct-Attached and Buffered I/O

Use `perf_test` defaults to use the system buffer cache. In some cases, such as sequential read tests on systems with a large amount of RAM, this can be an advantage because data read from the device can be cached in the system's buffer cache.

However, that does not help in qualifying the speed of the device itself. To better qualify the speed of the device being tested, use the `-o` option, which tells `perf_test` to use the `O_DIRECT` flag when attaching to the device, thus circumventing the buffer cache.

Specify less threads using the `-t` option for Windows and Linux drivers and specify more asynchronous I/Os using the `-A` option, as it reduces CPU context switching.

On Linux, the `-o` option is only available if the `libaio` and `libaio-devel` packages were installed with the Violin Utilities installation. For more information see Libaio Development Package on page 120.

Read / Write Ratio

Use the `-r` and `-w` options for defining a read:write ratio.

The default is 100% reads. To specify a 100% write mix, use the `-w1 -r0` options. For a `50%` read/write mix, use `-w1 -r1`.

The `-r` and `-w` values are added together to create a ratio for I/Os. For example, `-r80 -w20` is the same as `-r8 -w2`, which is effectively 80% reads and 20% writes.

Baselining the Memory Array System

It is recommended that you use the `perf_test` utility to characterize the Memory Array system as the first step in qualifying the system. These tests should include:

- Random reads at 4kB block size:(-R) (-b 4096)
- Sustained random writes at 4kB block size: (-R) (-w1)(-r0) (-b 4096)
- Random reads and writes at mix & the expected block size (given the application and file system): (-R) (-w1)(-r1) (-b)

Each of these tests should be run using asynchronous I/O settings (-A) and a range (-t) of thread counts (for example, 1- 64).

The baselines established using `perf_test` may enable you to identify performance issues at the operating system-layer, file system-layer, or database-layer of the Memory Array system.

Testing Read Bandwidth

By default, the `perf_test` accesses the first Memory Array device using a single thread for a repeated 4kB read of sector 0.

The following example shows a command that uses the (`-s`), (`-R`), (-b), (-d), and (`-p`) options to check the read bandwidth of the Memory Array.

```
# perf_test -s 384 -R -t4 -b 16384 -d5 -p /dev/rdsk/vtms2v1
Running with options:
  threads                = 4
  block_size             = 16384
  memory size            = 393216 MB
  memory start addr      = 0 MB
  write:read ratio       = 0:1
  random mode            = 1
  duration               = 5 secs
  path                   = /dev/rdsk/vtms2v1
  MB                     = 1000000 bytes
Time (sec) Read BW        Write BW    Total BW       Read IOPS  Write IOPS  Total IOPS
1          1259.292 MB/s  0.000 MB/s  1259.292 MB/s  76861      0           76861
2          1258.271 MB/s  0.000 MB/s  1258.271 MB/s  76798      0           76798
3          1259.717 MB/s  0.000 MB/s  1259.717 MB/s  76887      0           76887
4          1258.863 MB/s  0.000 MB/s  1258.863 MB/s  76834      0           76834
5          1258.300 MB/s  0.000 MB/s  1258.300 MB/s  76800      0           76800
Average    1258.889 MB/s  0.000 MB/s  1258.889 MB/s  76836      0           76836
```

The example shows that the read bandwidth is roughly 1.2 GB/s, which is what you might expect on a PCIe bus with the payload set to the lowest setting of 128-bytes.

Testing Write Bandwidth

To check the write bandwidth, use the `-w` and `-r` options to define the ratio of writes to reads at 1:0. This ratio enables you to determine the random percent of 1/Os that are writes.

In the following example, a performance test is run to check write bandwidth using the `-w1 -r0` options to place the write to read ratio at 1:0.

```
# perf_test -s 384 -R -t4 -b 16384 -w1 -r0 -d5 -p /dev/rdsk/vtms2v1
Running with options:
  threads                = 4
  block_size             = 16384
  memory size            = 393216 MB
  memory start addr      = 0 MB
  write:read ratio       = 1:0
  random mode            = 1
  duration               = 5 secs
  path                   = /dev/rdsk/vtms2v1
  MB                     = 1000000 bytes
Time (sec) Read BW    Write BW       Total BW      Read IOPS Write IOPS  Total IOPS
1          0.000 MB/s 1005.936 MB/s  1005.936 MB/s 0         61397       61397
2          0.000 MB/s 1005.924 MB/s  1005.924 MB/s 0         61396       61396
3          0.000 MB/s 1006.266 MB/s  1006.266 MB/s 0         61417       61417
4          0.000 MB/s 1006.104 MB/s  1006.104 MB/s 0         61407       61407
5          0.000 MB/s 1006.594 MB/s  1006.594 MB/s 0         61437       61437
Average    0.000 MB/s 1006.165 MB/s  1006.165 MB/s 0         61410       61410
```

The Memory Array write bandwidth reaches a maximum of roughly 1 GB/s on x8 PCIe.

APPENDIX A Product Models

This appendix describes the differences between the various Memory Array models.

Table A.1 Memory Array Models

Model #	Configuration
3205	21 x 256 GB VIMMs or 42 x 128 GB VIMMs
3210	42 x 256 GB VIMMs or 84 x 128 GB VIMMs
3120	42 x 512 GB VIMMs
3140	84 x 512 GB VIMMs

APPENDIX B Compliance Information

This appendix contains the following compliance information for the Memory Array.

- Regulatory Information on page 182
- Regulatory Model Number on page 182
- Electrical Safety on page 182
- Electrostatic Discharge (ESD) Precautions on page 182
- Lithium Battery Caution on page 183
- Cabinet Safety Precautions on page 183
- Disposal of Waste Equipment by Users in Private Households in the European Union on page 184
- Perchlorate Material - Special Handling May Apply on page 184
- European Union RFI Statement on page 184
- USA Radio Frequency Interference FCC Notice on page 184
- Japan Radio Frequency Interference VCCI on page 185
- Korea RFI Statement on page 185
- Canada RFI Statement on page 185
- Australia C-Tick Label on page 185

Regulatory Information

For your protection, this product has been tested for conformance to various national and international regulations and standards. The scope of this regulatory testing includes electrical and mechanical safety, electromagnetic emissions, immunity, acoustics, and hazardous materials.

Regulatory Model Number

For the purpose of regulatory compliance certifications and identification, this product is assigned a Violin Memory regulatory model number. This number can be found on the product label, along with the required approval markings and information. When requesting certification information for this product, always refer to this regulatory model number.

Note: Do not confuse the regulatory model number with the marketing or model number.

Electrical Safety

This product has not been evaluated for connection to an "IT" power system (AC distribution system having no direct connection to earth according to IEC 60950).

Installation Conditions

See installation instructions before connecting this equipment to the input supply.

WARNING! The equipment must be provided with a proper AC protective earth (PE) ground connection.

Network Connected Equipment

WARNING! The installation must provide a ground connection for the network equipment.

Electrostatic Discharge (ESD) Precautions

When handling any electronic component or assembly, you must observe the following antistatic precautions to prevent damage. An ESD kit (P/N A3024-

80004) is available (or supplied with memory additions). This kit contains one wrist strap, one conductive sheet, and one antistatic foam pad.

- Always disconnect power from the server and wear a grounded wrist strap when working around the server.
- Always wear a grounded wrist strap when handling printed circuit boards.
- Treat all assemblies, components and interface connections as static-sensitive.
- Avoid working in carpeted areas, and keep body movement to a minimum while removing or installing boards, to minimize buildup of static charge.

Lithium Battery Caution

WARNING! Observe the correct polarity when changing the lithium battery. There is a danger of explosion if battery is installed incorrectly.

Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions and local disposal requirements.

Note: Switzerland: Annex 4.10 of SR 814.013 applies to batteries.

Cabinet Safety Precautions

WARNING! Cabinets are heavy even when empty. Exercise caution when moving cabinets whether equipment is installed in the cabinet or not. Avoid rolling cabinets on rough or uneven surfaces or inclines greater than 10 degrees. Unloading cabinets from the pallet and movement of cabinets should be performed by at least two people.

Slidable products are not to be extended from the cabinet while the equipment is on the shipping pallet. The cabinet must be unloaded from the pallet and all anti-tip devices properly installed prior to extending any slidable product.

Once installed, all anti-tip devices must remain in place to maintain stability. Only one slidable product must be extended at a time.

Failure to follow these precautions can result in damage to equipment or injury to personnel.

Disposal of Waste Equipment by Users in Private Households in the European Union

This symbol on the product or on its packaging indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or the shop where you purchased the product.

Perchlorate Material - Special Handling May Apply

See http://www.dtsc.ca.gov/hazardouswaste/perchlorate.

This product may include a real-time clock battery or coin cell battery that may contain perchlorate and may require special handling when recycled or disposed of in California. Refer to the product user documentation to determine if this product contains batteries, and if so, the battery type(s) that are used.

European Union RFI Statement

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

USA Radio Frequency Interference FCC Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

The user is cautioned that changes or modifications not expressly approved by Violin Memory could result in the equipment being noncompliant with FCC Class A requirements and void the user's authority to operate the equipment.

Japan Radio Frequency Interference VCCI

VCCI 準拠クラスA機器（日本）
この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Korea RFI Statement

A급 기기 이 기기는 업무용으로 전자파 적합 등록을 한 기기이
오니 판매자 또는 사용자는 이 점을 주의하시기 바라며 만약
잘못 판매 또는 구입하였을 때에는 가정용으로 교환하시기 바랍니다.

Canada RFI Statement

This Class A digital apparatus complies with Canadian ICES-003.

Australia C-Tick Label

Figure B.1 Australian C-Tick Label

APPENDIX C Alarm Reference

This chapter describes how to diagnose Memory Array system alarms. The chapter describes service affecting and non-service affecting alarms which may occur during operation of the Memory Array and provides information on resolving those alarms in the following sections.

- Understanding Memory Array Alarms on page 188
- Service-Affecting Alarms on page 190
- Non-Service Affecting Alarms on page 196

Understanding Memory Array Alarms

The Memory Array provides you with key tools for identifying and interpreting raised alarms.

- Alarms are indicated by the state of the Alarm LED on the front of the Memory Array chassis.
- Information about an active alarm may then be viewed by running the `show system alarm` command or `show system message` command.

This appendix provides information about how to clear these alarms when they occur.

Interpreting Alarm LEDs

The current status of the Memory Array system may be indicated by the activity of the Alarm LED on the front of the chassis. The Alarm LED is red.

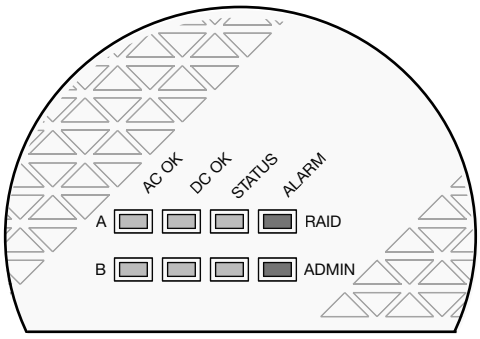


Figure C.1 Front System Status LEDs

The Alarm LED identifies the occurrence and severity of an error by its state: no light, a steady light, or a flashing light.

No Light	No alarm.
Steady Light	A service-affecting alarm has occurred. Service-affecting alarms are alarms which interrupt traffic and indicate that the data plane is either severely impacted or completely disabled.
Flashing Light	A non-service affecting error has occurred. Non-service affecting alarms are alarms which call attention to errors that do not affect data traffic on the system.

Many alarms occur during bootup and automatically clear as soon as the system stabilizes. For example, the Data Plane Unavailable alarm frequently occurs

during bootup because the data plane is not enabled until later in the process. Such alarms may be safely ignored.

Understanding System Alarm and System Message Commands

When hardware malfunctions or another error occurs on the Memory Array system, you are notified in the following ways: the Alarm LED on the front of the Memory Array chassis is lit (solidly or flashing) and a alarm is raised by the system.

The names of active system alarms and system messages may be viewed by running the `show system alarms` command or the `show system messages` command on the Memory Array.

- `show system alarms` command displays the current alarms on a Memory Array.
- `show system messages` command displays the current contents of the `/var/log/messages` file.

The `show system alarms` command and `show system messages` command may be run on either the Memory Array or a Syslog server on the host.

show system alarms command

The `show system alarms` command displays the current alarms on a Memory Array.

The command may be run by entering `show system alarms` at the root context level or, alternately, by entering `show` at the Alarm context prompt.

```
> show system alarms
alarm1 Data plane disabled
alarm2 Scheduler paused
alarm3 VIMM flash format in progress (2% complete)
alarm4 VIMM configuration OUT OF SPEC, 2 missing, 0 failed from 5
VIMM system
alarm5 CPL IRQs on VIMM 13: 0x00000c00
alarm6 CPL IRQs on VIMM 15: 0x00000c00
alarm7 CPL IRQs on VIMM 16: 0x00000400
```

The `show system alarms` command returns the name of every active alarm on the Memory Array system. Instructions for clearing system alarms are offered in this appendix.

show system messages Command

The `show system messages` command displays the current contents of the `/var/log/messages` file.

The message log file created on the Memory Array contains system log and typical boot up messages in addition to any set CLI commands that are run on the system.

The command may be run by entering `show system messages` at the root context level or, alternately, by entering `show messages` at the System context prompt.

```
system> show messages
Jun 13 10:12:07 syslog: oam_clkd: OAM +1 sec. time correction
(src==host).
Jun 13 10:37:01 last message repeated 4 time(s)
Jun 13 10:37:01 login[93]: root login  on `ttyS0'
Jun 13 10:37:01 oam_cli[93]: Opening session for userid 'admin'
Jun 13 10:44:12 syslog: oam_clkd: OAM +1 sec. time correction
(src==host).
Jun 13 10:56:31 last message repeated 2 time(s)
Jun 13 10:56:31 cpl_logd: [000027706] WARNING
ecpu_hwmgr_correlate_and_log_alarms(): ALARM-CLEAR: Scheduler
paused
Jun 13 10:56:31 cpl_logd: [000027706] WARNING
ecpu_hwmgr_correlate_and_log_alarms(): ALARM-CLEAR: System
booting
Jun 13 10:56:31 cpl_logd: [000027706] ERROR
ecpu_hwmgr_correlate_and_log_alarms(): ALARM-CLEAR: Data plane
unavailable
Jun 13 11:01:15 syslog: oam_clkd: OAM +1 sec. time correction
(src==host).
```

The `show system messages` command returns the name of every active alarm on the Memory Array system.

Service-Affecting Alarms

Service-affecting alarms are alarms raised by the system when an error occurs which interrupts traffic and indicates that the data plane is either severely impacted or completely disabled.

Unless noted otherwise, service-affecting alarms are indicated when the Alarm LED flashes. The LED stops flashing when the alarm clears and the system returns to a normal operational state.

This section is organized into eight topics:

- Equipment Service-Affecting Alarms on page 191
- Flash Service-Affecting Alarms on page 191
- Port Service-Affecting Alarms on page 192
- Power Service-Affecting Alarms on page 192
- RAID Service-Affecting Alarms on page 193
- System Service-Affecting Alarms on page 194
- Temperature Service-Affecting Alarms on page 195
- VIMM Service-Affecting Alarms on page 196

Equipment Service-Affecting Alarms

There are two service affecting equipment alarms.

- Booting Suspended, Fan-tray Missing Alarm on page 191
- Booting Suspended, Fans Missing Alarm on page 191

Booting Suspended, Fan-tray Missing Alarm

The Booting Suspended, Fan-tray Missing alarm indicates that one or more fan trays are missing on the Memory Array.

To clear the alarm, insert the missing fan tray(s).

Booting Suspended, Fans Missing Alarm

The Booting Suspended, Fans Missing alarm indicates that booting has been suspended because an insufficient number of fans were detected. The alarm indicates the number of fans missing.

Flash Service-Affecting Alarms

There are two service affecting flash alarms.

- Fatal Flash Error, <Hex-Value> Alarm on page 191
- Unformatted System Alarm on page 192

Fatal Flash Error, <Hex-Value> Alarm

The Fatal Flash Error, <Hex-Value> alarm indicates that a flash-based VIMM has encountered a fatal error and is no longer operational. The alarm indicates the non-functional VIMM number by the hex value displayed in the alarm. The system must shut down because the non-functional VIMM has made the current VIMM configuration invalid.

To clear the alarm, replace the non-functioning VIMM. Contact HP Customer Support for replacement parts.

Once a VIMM is replaced, the VIMM configuration should once again be valid.

Unformatted System Alarm

The Unformatted System alarm indicates that all the VIMMs in the system are unformatted. This alarm applies only to flash-based systems. The system is unusable until the system (VIMMs) are formatted.

Port Service-Affecting Alarms

There are two service affecting port alarms.

- No PCIe Host Detected on Enabled Port Alarm on page 192
- Port Negotiated to 0 Lanes Alarm on page 192

No PCIe Host Detected on Enabled Port Alarm

The No PCIe Host Detected on Enabled Port alarm indicates that the PCIe cable has not been connected to the specified enabled port. The PCIe port is specified as 1 or 2.

To clear the alarm, connect a PCIe cable between the enabled port and an active PCIe card on a host computer.

Port Negotiated to 0 Lanes Alarm

The Port Negotiated to 0 Lanes alarm indicates that the PCIe connection failed to negotiate any communications lanes between the PCIe card in the host and the Memory Array. The Alarm LED flashes.

To clear the alarm, change the PCIe cable, card, or host computer to compatible components.

Power Service-Affecting Alarms

There are two service affecting power alarms.

- AC Power Failure, Shutting Down Alarm on page 193
- Main Power Failure, System Shut Down Alarm on page 193

AC Power Failure, Shutting Down Alarm

The AC Power Failure, Shutting Down alarm indicates a failure in the power feeds to the power supplies.

Main Power Failure, System Shut Down Alarm

The Main Power Failure, System Shut Down alarm indicates a failure detected in the main power supplies.

RAID Service-Affecting Alarms

There are five service affecting RAID alarms.

- FATAL RAID Error Alarm on page 193
- Multiple RAID Errors Alarm on page 193
- RAID Group Faulted Alarm on page 194
- RAID Consistency Error Alarm on page 193
- RAID Group Faulted Alarm on page 194

FATAL RAID Error Alarm

The FATAL RAID Error alarm indicates that a fatal RAID group error has been detected at the displayed vector. A properly configured RAID group configuration is necessary for the system to be operational.

To clear the alarm, restart the system. Contact HP Customer Support for assistance.

Multiple RAID Errors Alarm

The Multiple RAID Errors alarm indicates that more than one RAID error has occurred and at what location.

This is a nonrecoverable error. Contact HP Customer Support for assistance.

RAID Consistency Error Alarm

The RAID Consistency Error alarm indicates that there is a consistency error with the RAID grouping and at what location.

This is a nonrecoverable error. Contact HP Customer Support for assistance.

RAID Group Faulted Alarm

The RAID Group Faulted alarm indicates that two or more VIMMs in the specified RAID group have failed and no spares are available to rebuild the RAID group.

To clear the alarm, replace the failed VIMMs and insert spares.

RAID V2P Error Alarm

The RAID V2P Error alarm indicates that the RAID group has experienced an error with a VIMM at the specified ID number. The Alarm LED flashes.

This is a nonrecoverable error. Contact HP Customer Support for assistance.

System Service-Affecting Alarms

There are six service affecting system alarms.

- Data Plane Unavailable Alarm on page 194
- I/O Timeout From Host Alarm on page 194
- Scheduler Paused Alarm on page 195
- Unable to Poll VIMM Temperatures; System Shutdown Alarm on page 195
- System Booting Alarm on page 195
- System Shut Down Alarm on page 195

Data Plane Unavailable Alarm

The Data Plane Unavailable alarm indicates that the data plane is unavailable. This alarm occurs under various conditions, including during a system boot if the system experiences an unrecoverable PCIe error, and if the host does not receive a I/O response within a specific time interval.

If the alarm occurs on bootup, this alarm is self-clearing and clears upon successful completion of the bootup process.

To clear this alarm if it occurs because of an unrecoverable PCIe error, check your PCIe connections and reboot the system and the host.

I/O Timeout From Host Alarm

The I/O Timeout From Host alarm indicates that an I/O request from the host to the Memory Array timed out before the request was acknowledged. This time out results in a disabling of the data plane and the alarm LED flashes until the system is restarted.

This is a nonrecoverable error. Contact HP Customer Support for assistance.

Scheduler Paused Alarm

The Scheduler Paused alarm indicates that the hardware scheduler temporarily paused during bootup or when a VIMM is being taken out of service.

To clear the alarm, wait for the system to successfully complete the bootup process.

Unable to Poll VIMM Temperatures; System Shutdown Alarm

The Unable to Poll VIMM Temperatures; System Shutdown alarm indicates that the management channel is not allowing temperatures on the VIMMs to be polled, which should never happen. The system is shut down to prevent a overheating.

System Booting Alarm

The System Booting alarm indicates that the system is in the bootup process.

To clear the alarm, wait for the system to successfully complete the bootup process.

System Shut Down Alarm

The alarm indicates the system has been shut down.

Temperature Service-Affecting Alarms

There is one service-affecting temperature alarm.

Mozart Overheated, System Shut Down Alarm

The Mozart Overheated, System Shut Down alarm indicates that the main processor of the system experienced temperatures over the acceptable maximum temperature and has shut the system down to prevent damage to the equipment. The alarm specifies the system's current temperature in Celsius.

To clear the alarm, reboot the system, check the fans for proper operation, check the fan filter for cleanliness, and check the ambient temperature of the system.

VIMM Service-Affecting Alarms

There are four service affecting VIMM alarms.

- Insufficient VIMMs Alarm on page 196
- Main Controller Does Not Support VIMMs Alarm on page 196
- Multiple VIMMs Failed; System Shut Down Alarm on page 196
- VIMM Flash Format In Progress Alarm on page 196

Insufficient VIMMs Alarm

The Insufficient VIMMs alarm indicates that an insufficient number of VIMMs have been detected to construct a usable system.

Main Controller Does Not Support VIMMs Alarm

The Main Controller Does Not Support VIMMs alarm indicates that the software version running on the main controller does not support the specified VIMM type: `Flash` or `DRAM`.

Multiple VIMMs Failed; System Shut Down Alarm

The Multiple VIMMs Failed; System Shut Down alarm indicates that multiple VIMMs are not operational and the system must shut down because the non-functional VIMMS have made the current VIMM configuration invalid.

To clear the alarm, replace the non-functioning VIMMs. Call HP Customer Support for replacement parts.

After replacing the VIMMs in the system, the VIMM configuration should once again be valid.

VIMM Flash Format In Progress Alarm

The VIMM Flash Format In Progress alarm indicates that VIMMs are being formatted. The alarm continues to be raised while the format is in progress and is cleared automatically when the format has completed. If any VIMMs fail to format, an alarm is raised on each VIMM.

Non-Service Affecting Alarms

Non-service affecting alarms are alarms which call attention to errors which do not affect data traffic on the system.

Unless noted otherwise, non-service affecting alarms are indicated whenever the Alarm LED displays a steady light. When the alarm clears and the system returns to a normal operational state, the Alarm LED displays no light.

This sections describes the non-service affecting alarms that may be raised on the system and provides instructions for resolving those alarms.

This section is organized into seven topics:

- Temperature Non-Service Affecting Alarms on page 197
- Equipment Non-Service Affecting Alarms on page 198
- Flash Non-Service Affecting Alarms on page 199
- Port Non-Service Affecting Alarms on page 200
- Power Non-Service Affecting Alarms on page 201
- RAID Non-Service Affecting Alarms on page 202
- VIMM Non-Service Affecting Alarms on page 202

Temperature Non-Service Affecting Alarms

Two non-service affecting temperature alarms may be raised by the system:

- Mozart Overheating Alarm on page 197
- High Temperature on Board Sensor Alarm on page 197

Mozart Overheating Alarm

The Mozart Overheating alarm indicates that the main processor of the system is experiencing temperatures over the acceptable maximum temperature. The alarm specifies the system's current temperature in Celsius.

If the chassis is cooled down to within the acceptable temperature range, the system will not shut down.

To clear the alarm, confirm that the fans are operating correctly, there are no airflow restrictions, the lid is in place, and the ambient temperature is within the acceptable range.

High Temperature on Board Sensor Alarm

The High Temperature on Board Sensor alarm indicates that the specified board sensor on the system is unreadable and that the system cannot retrieve system environment information.

To clear the alarm, check fan operation, the fan filter, and the ambient temperature of the system.

Equipment Non-Service Affecting Alarms

There are seven non-service affecting equipment alarms.

- Board Sensor Unreadable Alarm on page 198
- Lid Removed Alarm on page 198
- Fan Tray Removed Alarm on page 198
- Fan Missing Alarm on page 198
- Fan Running Too Slowly Alarm on page 199
- Fan Tray Removed Alarm on page 199
- Fan Running Too Slowly Alarm on page 199

Board Sensor Unreadable Alarm

The Board Sensor Unreadable alarm indicates that the specified board sensor is unreadable and that the system cannot retrieve system environment information.

To clear the alarm, check for equipment failure and contact HP Customer Support.

Lid Removed Alarm

The Lid Removed alarm indicates that the lid has been removed. The system is still operational, but the temperature of the system could be compromised and the lid must be replaced.

To clear the alarm, replace the lid.

Fan Tray Removed Alarm

The Fan Tray Removed alarm indicates that the specified fan tray has been removed (after system boot up). The alarm specifies whether the top (1) or bottom (2) fan tray has been removed. The Alarm LED is steadily lit.

To clear the alarm, replace the fan tray in the system.

Fan Missing Alarm

The Fan Missing alarm indicates the specified fan is missing.

Fan Running Too Slowly Alarm

The Fan Running Too Slowly alarm indicates that the fan specified is present but is spinning slowly. The speed of the fan is given in rpm.

Fan Tray Removed Alarm

The Fan Tray Removed alarm indicates that the specified fan tray has been removed after the system has booted. The alarm specifies whether the top (1) or bottom (2) fan tray has been removed.

To clear the alarm, replace the fan tray in the system.

Fan Running Too Slowly Alarm

The Fan Running Too Slowly alarm indicates that the specified fan is running at a much lower speed than it should. The alarm specifies the top (1) or bottom (2) fan tray and the fan within that fan tray: `left`, `center`, or `right`.

To clear the alarm, replace the fan tray in the system.

Flash Non-Service Affecting Alarms

There are five non-service affecting flash alarms.

- Flash CPL IRQs on VIMM Alarm on page 199
- Flash Format Failed on VIMM Alarm on page 199
- Flash Sequence Number Mismatch Alarm on page 200
- Preparing Flash on VIMM Alarm on page 200
- VIMM Flash Format In Progress Alarm on page 200

Flash CPL IRQs on VIMM Alarm

The Flash CPL IRQs on VIMM alarm indicates that an error has been detected by the Flash VIMM Control Plane.

This is a fatal error on the VIMM and it must be taken out-of-service, using the `set chassis board 0 slot XX vimm admin-state down` command and returned.

Flash Format Failed on VIMM Alarm

The Flash Format Failed on VIMM alarm indicates that the format operation on the specified VIMM failed. The VIMM will be taken out-of-service.

Flash Sequence Number Mismatch Alarm

The Flash Sequence Number Mismatch alarm indicates that the VIMM sequence numbers in a particular RAID group do not match when data is written to those VIMMs.

To clear the alarm, update the sequence number on all the VIMMs in the group. The data on those VIMMs may be corrupt.

Preparing Flash on VIMM Alarm

The Preparing Flash on VIMM alarm indicates that flash is being prepared on the specified VIMM for use by the system. This alarm clears once the flash preparations have completed.

VIMM Flash Format In Progress Alarm

The VIMM Flash Format In Progress alarm indicates that the flash VIMMs formatting is in progress. To begin the flash formatting, the system must be rebooted first.

The alarm LED flashes.

To clear the alarm:

1. Wait for the system to successfully complete the boot up process.
2. Type `show system alarm` to display the percentage of the flash format progress.

Port Non-Service Affecting Alarms

There are two non-service affecting port alarms.

- PCIe Cable Plugged Into Disabled Port Alarm on page 200
- Port Is Not Running at the Maximum Data Rate Possible Alarm on page 201

PCIe Cable Plugged Into Disabled Port Alarm

The PCIe Cable Plugged Into Disabled Port alarm indicates that the PCIe cable has been connected to the specified disabled port: 1 or 2. The Alarm LED is not lit when this alarm occurs.

To clear the alarm, disconnect the PCIe cable from the disabled port.

Port Is Not Running at the Maximum Data Rate Possible Alarm

The Port Is Not Running at the Maximum Data Rate Possible alarm occurs when the negotiated rate of the connection on the specified port is lower than the maximum possible data rate.

This error can occur, for example, when the PCIe card used in the host is not compatible with the host computer chipset or if the PCIe extender card in the host is not inserted into a PCIe that supports the maximum data rate (e.g. the slot is mechanically x8 but electrically x4).

The Alarm LED is not lit when the negotiated rate is x4 or higher, but the alarm is logged. If the rate drops to less than x4, service is affected and the Alarm LED flashes.

See Booting Suspended, Fan-tray Missing Alarm on page 191 for details of what happens when PCIe lane negotiation fails.

To clear the alarm, change the PCIe card, host computer, or PCIe slot to compatible components.

Power Non-Service Affecting Alarms

There are three non-service affecting power alarms.

- Power Supply Missing Alarm on page 201
- Power Supply Failure Alarm on page 201
- Power Supply: Polling Failure Alarm on page 201

Power Supply Missing Alarm

The Power Supply Missing alarm indicates that a power supply is missing.

Power Supply Failure Alarm

The Power Supply Failure alarm indicates that a power supply has failed.

Power Supply: Polling Failure Alarm

The Power Supply: Polling Failure alarm indicates a failure to poll the specified power supply.

RAID Non-Service Affecting Alarms

There are four non-service affecting RAID alarms.

- Power Supply: Polling Failure Alarm on page 201
- RAID Group Unprotected Alarm on page 202
- RAID Rebuild in Progress Alarm on page 202
- RAID Rebuild of Group Completed with Errors (No Additional Information Available) Alarm on page 202

RAID Group Unprotected Alarm

The RAID Group Unprotected alarm indicates that one VIMM in the specified RAID group has failed and that the group is no longer RAID protected, because no spare VIMMs are available to rebuild the RAID group.

To clear the alarm, replace the failed VIMM and insert a spare VIMM. For step-by-step instructions see Replacing VIMMs on page 113.

The Alarm LED turns off when the system returns to a normal operational state and the alarm clears.

RAID Rebuild in Progress Alarm

The RAID Rebuild in Progress alarm indicates that a RAID group rebuild is in progress for the specified RAID and lists the group VIMM ID that is built.

To clear the alarm, wait for the system to complete the RAID group rebuild and return to a normal operational state.

RAID Rebuild of Group Completed with Errors (No Additional Information Available) Alarm

The RAID Rebuild of Group Completed with Errors (No Additional Information Available) alarm indicates that a RAID rebuild of the specified group failed.

Raid Rebuild Of Group Completed with Errors Starting at 4K Address Alarm

The Raid Rebuild Of Group Completed with Errors Starting at 4K Address alarm indicates that a RAID rebuild of the specified group failed, as well as the starting address.

VIMM Non-Service Affecting Alarms

There are 20 non-service affecting VIMM alarms.

- Excessive ECC Errors on VIMM Alarm on page 203
- Failed to Validate Configuration of VIMMS, Raid Group Alarm on page 204
- No Spare Memory Modules Alarm on page 204
- Programming VIMM Alarm on page 204
- Unsupported VIMM Configuration Alarm on page 204
- VIMM Booting Alarm on page 204
- VIMM Configuration Out Of Spec Alarm on page 204
- VIMM Failed Alarms on page 205
- VIMM Extremely Hot; VIMM Shutdown Alarm on page 205
- VIMM Failed Alarm on page 206
- VIMM Failed: Excessive ECC Errors Alarm on page 206
- VIMM Hot Alarm on page 206
- VIMM Incompatible Formatted Capacity Alarm on page 206
- VIMM in Maintenance State Alarm on page 206
- VIMM Isolated Alarm on page 207
- VIMM Temperature Unreadable, VIMM Shut Down Alarm on page 207
- VIMM Unformatted Alarm on page 207
- VIMM Voltage; VIMM Shut Down Alarm on page 207
- VIMM Threshold Exceeded Alarm on page 207
- Fan Running Too Slowly Alarm on page 207

Excessive ECC Errors on VIMM Alarm

The Excessive ECC Errors on VIMM alarm indicates that the system has detected an excessive number of ECC errors on the specified VIMM.

To clear the alarm, replace the VIMM.

Failed to Validate Configuration of VIMMs Alarm

The Failed to Validate Configuration of VIMMs alarm indicates, on a VIMM-by-VIMM basis, that configuring the VIMM failed. Configuring the VIMM sets several parameters to allow it to be usable within the Memory Array.

This alarm should not occur and could indicate a faulty VIMM.

Failed to Validate Configuration of VIMMS, Raid Group Alarm

The Failed to Validate Configuration of VIMMS, Raid Group alarm indicates that the system failed to validate the current VIMM configuration. The alarm lists the ID of the invalid VIMMs and the RAID group in which the error has occurred.

To clear the alarm, remove and replace the failed VIMMs.

No Spare Memory Modules Alarm

The No Spare Memory Modules alarm indicates that the system no longer contains any available VIMMs.

To clear the alarm, add spare VIMMs or replace VIMMs that have failed.

Programming VIMM Alarm

The Programming VIMM alarm indicates that the specified VIMM is currently being programmed by the system software.

To clear the alarm, wait for the system to complete the programming of the VIMM.

Unsupported VIMM Configuration Alarm

The Unsupported VIMM Configuration alarm indicates that the current VIMM configuration consisting of a specified number of RAID group(s) is invalid and unsupported.

To clear the alarm, replace the missing VIMM or failed VIMMs.

For partially-populated systems, install the VIMMs in specific slots. If not, then the system may or may not have difficulty using all of the VIMMs efficiently

VIMM Booting Alarm

The VIMM Booting alarm indicates that the VIMM is in the process of booting and lists the percentage completed in the boot up process. The alarm clears when the VIMM has completely booted up.

VIMM Configuration Out Of Spec Alarm

The VIMM Configuration Out of Spec alarm indicates that the current VIMM configuration is invalid.

The `show system status` command and the alarm message lists the number of system VIMMs that are missing, failed, in maintenance, or in an admin down state.

To clear the alarm, list the failed VIMMs using the `show system status` command, and shut down the system to replace the missing VIMMs.

VIMM Failed Alarms

A VIMM Failed alarm indicates that the VIMM failed for one of the following reasons, and that it has been taken out-of-service.

High temperature threshold exceeded	The alarm indicates that the highest temperature that the system can run under has been exceeded.
Failed to read temperature	The alarm indicates that the system has failed to read the current temperature.
Voltage out of range	The alarm indicates that the systems voltage is either too high or too low.
Isolated	The alarm indicates that the system has been isolated.
Dead	The alarm indicates that the system is considered dead.
Excessive ECC errors	The alarm indicates that the amount of ECC errors has been exceeded.
Incompatible memory configuration	The alarm indicates that the memory was not properly configured.
Formatted capacity is incompatible with system	The alarm indicates that the format of memory is not compatible.
Formatted capacity is zero	The alarm indicates the memory has not been formatted.
Failed to set VIMM ID	The alarm indicates that the VIMM IDs were not set.
Failed to set context	The alarm indicates that the context was not set.

VIMM Extremely Hot; VIMM Shutdown Alarm

The VIMM Extremely Hot; VIMM Shutdown alarm indicates that the temperature of the specified VIMM is out of the acceptable temperature range and the VIMM automatically shuts down. The alarm specifies the last read temperature of the VIMM in Celsius.

To clear the alarm:

1. Check for any airflow restrictions, including the filter in the front panel.
2. If there are no airflow issues and the environment is within specifications, replace the VIMM.

VIMM Failed Alarm

The VIMM Failed alarm indicates that the specified VIMM has failed and is inoperable.

To clear the alarm, replace the VIMM.

VIMM Failed: Excessive ECC Errors Alarm

The VIMM Failed: Excessive ECC Errors alarm indicates that a specific VIMM is taken out-of-service because it experienced excessive ECC errors.

VIMM Hot Alarm

The VIMM Hot alarm indicates that the specified VIMM is reaching its maximum temperature within the acceptable temperature range. The alarm specifies the VIMM ID and the current temperature in Celsius. The VIMM shuts down if the temperature reaches the maximum acceptable temperature.

To clear the alarm:

1. Check for any airflow restrictions, including the filter in the front panel.
2. If there are no airflow issues and the environment is within specifications, replace the VIMM.

VIMM Incompatible Formatted Capacity Alarm

The VIMM Incompatible Formatted Capacity alarm indicates that the specified VIMM has a formatted capacity that is different than the rest of the system, and is thus not being used.

VIMM in Maintenance State Alarm

The VIMM in Maintenance State alarm indicates that the specified VIMM is in maintenance state.

To clear the alarm, set the VIMM into an active, operable state.

VIMM Isolated Alarm

The VIMM Isolated alarm indicates that the specified VIMM is isolated and not reachable by any other VIMM within the tree. This is caused by the failure of other VIMMs, preventing a path from the main controller to the VIMM.

To clear the alarm, replace the failed VIMM(s).

VIMM Temperature Unreadable, VIMM Shut Down Alarm

The VIMM Temperature Unreadable, VIMM Shut Down alarm indicates that the temperature for the specified VIMM cannot be read and the VIMM has been shut down.

To clear the alarm, replace the VIMM.

VIMM Unformatted Alarm

The VIMM Unformatted alarm indicates that the specified VIMM is unformatted, and is thus not being used.

VIMM Voltage; VIMM Shut Down Alarm

The VIMM Voltage; VIMM Shut Down alarm indicates an over/under voltage condition and the voltage reading just before shutdown for a specific VIMM.

To clear the alarm, replace the VIMM.

VIMM Threshold Exceeded Alarm

The VIMM Threshold Exceeded alarm indicates that a VIMM has been taken out of service due to an exceeded monitored threshold.

Fan Running Too Slowly Alarm

The Fan Running Too Slowly alarm indicates that the specified fan is running at a much lower speed than it should. The alarm specifies the top (1) or bottom (2) fan tray and the fan within that fan tray: `left`, `center`, or `right`.

To clear the alarm, replace the fan tray in the system.

APPENDIX D CLI Reference

This appendix lists and describes the available commands in the Command Line Interface (CLI) for the Memory Array. The CLI is comprised of several context levels, each of which contains various commands. The appendix is organized by context level and lists the available subcontext levels and commands in each level in the following sections.

- Context Navigation on page 211
- General Commands on page 213
- Chassis Context Commands on page 221
- Board 0 Context Commands on page 223
- Slot Context Commands on page 227
- VIMM Context Commands on page 230
- VIMM-summary Context Commands on page 233
- Controller Context Commands on page 236
- Ethernet 0 Context Commands on page 238
- Fan-tray Context Commands on page 243
- Fan Context Commands on page 244
- CLI Context Commands on page 245
- RAID Context Commands on page 251
- RAID Group Context Commands on page 253
- Maps Context Commands on page 255
- System Context Commands on page 257
- Alarms Context Commands on page 273
- Boot-params Context Level on page 275
- LED-state Context Commands on page 277
- Logging Context Commands on page 279

- In-memory Context Commands on page 281
- Category Context Commands on page 285
- Syslog Context Commands on page 287
- Status Context Commands on page 290
- Sw-upgrade Context Commands on page 294
- Uptime Context Commands on page 297
- Version Context Commands on page 298

Context Navigation

The CLI consists of a context hierarchy to access the various system components. Each system component and function has its own context level, which can be specified at a command prompt when entering a command. After entering the command to change to a specific context level, the prompt changes to indicate where you are within the CLI hierarchy.

The following global commands let you navigate within the context levels of the CLI.

- The `top` command lets you navigate back to the root context level.
- The `up` command lets you move up one context level.

General Commands on page 213 are available at any context level of the CLI.

Typing CLI Commands

When typing a CLI command, specify the context level in one of two ways:

1. Define the context level while entering the command from the root context level
2. Navigate to the context level then enter the command

Define the context level while entering the command from the root context level

Include the context level when typing a command. For example, to display the speed of the left fan in the top fan tray in one command at the root level

From the root context level, type:

```
show chassis fan-tray 1 fan left
```

Tip: In the following sections, all examples enter the commands at the associated context level. This is an optional method. Instead of typing a command to navigate to a context level, then typing another command at that level, you can type one command. For example, to set the hostname, instead of typing:

```
context system
set name <hostname>
```

type:

```
set system name <hostname>
```

Use tab completion or help to display the available parameters for a particular command. Tab completion may require you to tab through additional levels and parameters to complete the desired command.

Navigate to the context level then enter the command

When you navigate to the context level and then issue the command, you are moving to that command's context level. The `context <level>` command lets you navigate into a lower level of the CLI command hierarchy. Specify the various levels that are depicted in Figure D.1, Context Levels on page 214.

For example, to display the speed of the left fan in the top fan tray (where *1* is top and *2* is bottom):

1. Move to the context level for the left fan by typing the following command at the root level:

```
context chassis fan-tray 1 fan left
```

2. Type the following command at the `fan left` context level:

```
show
```

General Commands

The table below describes the general commands available at any context level of the CLI.

Table D.1 General Commands

Command	Description
`cancel`	Cancels a scheduled reboot and CLI session.
`clear`	Initializes or erases the indicated system resource.
`context`	Moves to lower context level.
`exit`	Exits the CLI.
`format`	Formats flash capacity.
`help`	Displays this list of commands.
`history`	Retrieves the most recently typed user commands.
`ping`	Sends an ICMP `ECHO_REQUEST` to another network host.
`reboot`	Reloads/restarts the indicated processor.
`reset`	Resets the Ethernet Interface. See the Ethernet 0 Context Commands on page 238.
`restore`	Restores system configuration parameters. See `restore config` on page 265.
`save`	Save system configuration parameters. See `save config` on page 264.
`set`	Sets the specified Memory Array parameter.
`show`	Displays Memory Array parameters.
`shutdown`	Shuts down the system.
`top`	Returns to the top most command node of the CLI.
`up`	Moves up one node level in the CLI command tree.
`?`	Retrieves help on commands, arguments and subnodes.

cancel

Cancels or unschedules a scheduled reboot or the specified CLI session. To cancel a CLI session you must first know the ID of the CLI session. Get this information using the `show session` command.

Syntax

```
cancel {cli | system} {session <session_id> | reboot}
```

Where:

`cli`	Cancels the CLI.
`system`	Cancels a scheduled reboot.
`session <session_id>`	Cancels the specified CLI session.
`reboot`	Cancels a system reboot.

clear

Clears the system log file.

Syntax

```
clear system log
```

context

Navigates into a lower level of the CLI command hierarchy. Specify the various levels that are depicted in the figure below.

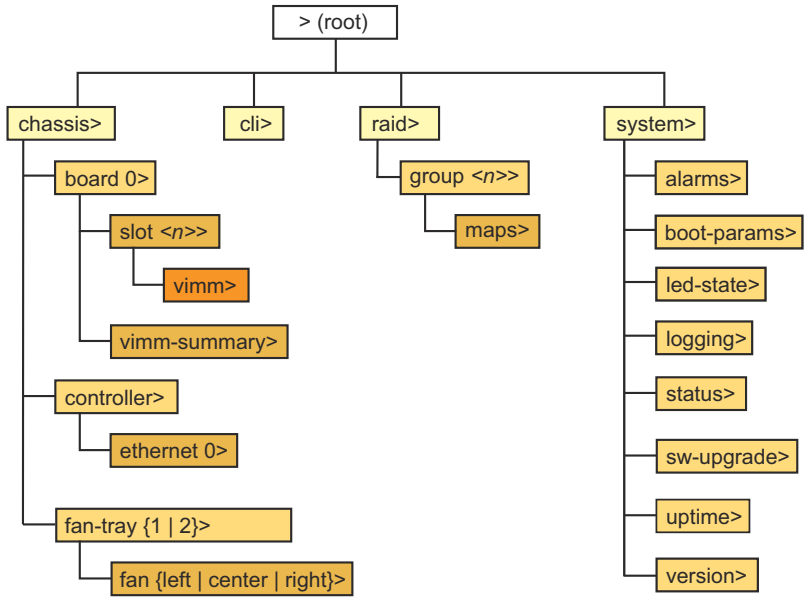


Figure D.1 Context Levels

Syntax

```
context <context_level>
```

Where:

context_level	Specifies the context level to navigate to. Valid values are: • `chassis` (See Chassis Context Commands on page 221.) • `cli` (See CLI Context Commands on page 245.) • `raid` (See RAID Context Commands on page 251.) • `system` (See System Context Commands on page 257.)

The available commands and sublevels are different in each context level.

exit

Exits the CLI.

Syntax

```
exit
```

format

Configures the system for a specific percentage of usable flash capacity.

Note: Use this command only on a flash-based Memory Arrays.

Note: The format command will be rejected if there are any open files accessing the memory array storage device (`/dev/vtmsa`). Close any open files or unmount any mounted filesystems using the storage device. To unmount the file system use the `umount` Linux command (e.g., `umount /dev/vtmsa`).

Syntax

```
format flash-capacity [<value>]
```

Where:

value Specifies the percentage of usable flash capacity. Valid values are:
- 50
- 65
- 78
- 84
- 87
- 90 — Not recommended for high performance or high reliability systems.

Default is 65%.

Higher usable percentages provide more usable capacity where needed. Lower usable percentages increase system write performance, endurance, and reliability. For advice on selecting a good usable percentage, consult with HP Customer Support.

help

Lists the available general commands, or information on a specific command.

Syntax

```
help [<command>]
```

Where:

command The specific command to get help information about.

history

Displays the most recently used CLI commands.

Syntax

```
history
```

Example

To display the most recently issued CLI commands, type:

```
history
```

The command displays information similar to the following:.

```
chassis board 0 slot 67> history
01 - context chassis
02 - help
03 - ?
04 - up
05 - context chassis
06 - context board 0
07 - context slot 4
08 - context vimm
09 - top
10 - context system version
```

ping

Sends an ICMP ECHO_REQUEST messages to another network host.

Syntax

`ping { <hostname> | <ip_address> }`

Where:

hostname	Specifies the hostname to send the ICMP ECHO_REQUEST messages to.
ip_address	Specifies the IP address to send the ICMP ECHO_REQUEST messages to.

reboot

Schedules a system reboot to run immediately or to be delayed in minutes, up to 1 day. While the system is rebooting your CLI connection will be lost and you will have to log back into the interface.

Syntax

`reboot system {all | oam} [delay <n>]`

Where:

`all`	Reboots both the *System* and *OAM* processors.
`oam`	Reboots only the OAM processor
`delay <n>`	Sets the time delay in minutes for rebooting the system. Valid values are in the range of 1 to 1440.

If you do not specify the time delay, you are prompted whether to reboot the system immediately. Answer **y** to reboot immediately or **n** to cancel the immediate reboot request.

See Rebooting the Memory Array on page 98 for more information.

reset

Resets the Ethernet interface. During a reset, active Telnet and SSH sessions are terminated, which is useful if the session is hung.

Syntax

```
reset chassis controller ethernet 0
```

set

Runs the specified command parameters.

Syntax

```
set <parameter> [<value>]
```

Where:

parameter	The command parameter to run. The available parameters are different at each context level.
value	The value to which the parameters should be set, if required.

show

Displays the results for the specified requested information.

Syntax

```
show [<parameter>]
```

Where:

parameter Specifies the information to display. This parameter may include a context level, including:

- vimm <slot>
- vimm-summary
- ethernet
- fan-speed
- alarms
- uptime
- version

Example

To show information for the chassis board 0 type:

```
show chassis board 0 info
```

The command displays information similar to the following:.

```
chassis board 0 > show info
part-number           1000074P-A
version               0
serial-number         6AD074WP00005
mfg-date              20070420
environment
     ambient-temp          39C (OK)
     controller-temp       69C (OK)
     sensor-12v-a          1.84
     sensor-12v-b          11.50
```

shutdown

Shuts down the system. In shutdown mode the media is taken offline and I/O stopped to the connected hosts, but the array is left powered on and able to be managed via the CLI. Use the `reboot` CLI command to bring the Memory Array back online.

Syntax

```
shutdown
```

top

Moves back up to the root level (topmost context level) of the CLI.

Syntax

`top`

Example

If you are at the Chassis board 0 context level and you want to move to the root level of the CLI, at the `chassis board 0>` prompt, type:

```
chassis board 0> top
```

up

Moves back up one context level of the CLI.

Syntax

`up`

Example

If you are at the Chassis board 0 context level and you want to move up one level of the CLI, at the `chassis board 0>` prompt, type:

```
chassis board 0> up
```

You will be moved to the Chassis context level, which displays the following prompt:

```
chassis>
```

?

Lists the available selections for a specified command. If no command is specified, then the General Commands are listed.

Syntax

`[<command>] ?`

Where:

command	The command for which to display help.

Chassis Context Commands

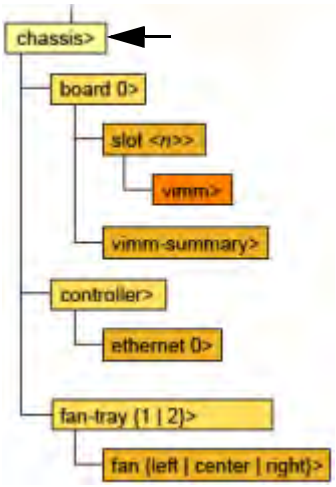


Figure D.2 Chassis Context Commands

The table below describes the commands available at the Chassis context level of the CLI.

Table D.2 Chassis Context Commands

Command	Description
`context board 0`	Moves the user to the Board 0 context level.
`context controller`	Moves the user to the Controller context level.
`context fan-tray`	Moves the user to the specified fan tray context level.

context board 0

Moves to the Board 0 context level.

Syntax

```
context board 0
```

The system prompt changes to the following:

```
chassis board 0>
```

context controller

Moves to the Controller context level.

Syntax

```
context controller
```

The system prompt changes to the following:

```
chassis controller>
```

context fan-tray

Moves to the specified Fan-tray context level. See Fan-tray Context Commands on page 243.

Syntax

```
context fan-tray {1 | 2}
```

Where:

1	Indicates the top fan tray context level.
2	Indicates the bottom fan try context level

The system prompt changes to the following for the top fan tray:

```
chassis fan-tray 1>
```

The system prompt changes to the following for the bottom fan tray:

```
chassis fan-tray 2>
```

Board 0 Context Commands

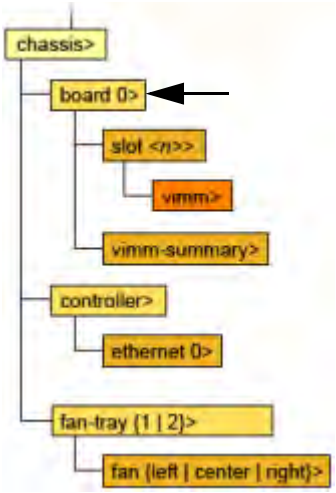


Figure D.3 Chassis>Board 0 Context Commands

The table below describes the commands available at the Board 0 context sublevel of the CLI.

Table D.3 Board 0 Context Commands

Command	Description
`context slot`	Moves the user into the context level for the specified slot. See Slot Context Commands on page 227.
`set flash-scrubbing`	Sets whether the flash memory is scrubbed or not.
`show flash-scrubbing`	Displays whether the flash memory scrubbing function has been enabled or not. **Note:** Use this command only on a flash-based Memory Array.
`show info`	Displays information about the main board in the system.
`set write-buffer`	Enables or disables write buffer on the flash-based VIMMs. **Note:** Use this command only on a flash-based Memory Array.
`show write-buffer`	Displays whether the write buffer on the flash-based VIMMs has been enabled or not.

context slot

Moves into the context level for the specified slot.

Syntax

`context slot <n>`

Where:

<n>	Moves the user into the context level for the specified slot - <*n*>. Valid values are in the range of `0-83`, inclusive. See Slot Context Commands on page 227.

The system prompt changes to the following:

```
chassis board 0 slot n>
```

Example

To move into the context level for slot 56, at the Board 0 context prompt, type:

```
context slot 56
```

The command displays information similar to the following:.

```
chassis board 0> context slot 56
chassis board 0 slot 56>
```

set flash-scrubbing

Note: Use this command only on a flash-based Memory Array.

Enables or disables flash memory scrubbing.

Syntax

```
set flash-scrubbing {enabled | disabled}
```

Where:

`enabled`	Enables scrubbing of flash memory.
`disabled`	Disables scrubbing of flash memory.

The command displays information similar to the following:.

```
chassis board 0> set flash-scrubbing enabled
flash-scrubbing     enabled
```

show flash-scrubbing

Displays the status of flash memory scrubbing.

Syntax

```
show flash-scrubbing
```

The command displays information similar to the following:.

```
chassis board 0> show flash-scrubbing

flash-scrubbing      disabled
```

show info

Displays manufacturing and environmental information about the main board in the system.

Syntax

```
show info
```

The command displays information similar to the following:

```
chassis board 0> show info

part-number          1000074-C-04
version              0
serial-number        6C0479WX00113
mfg-date             20070928
```

set write-buffer

Note: Use this command only on a flash-based Memory Array.

Enables or disables write buffer on the flash VIMMs.

Syntax

```
set write-buffer {enabled | disabled}
```

Where:

`enabled`	Enables the write buffer on the flash VIMMs.
`disabled`	Disables the write buffer on the flash VIMMs.

Slot Context Commands

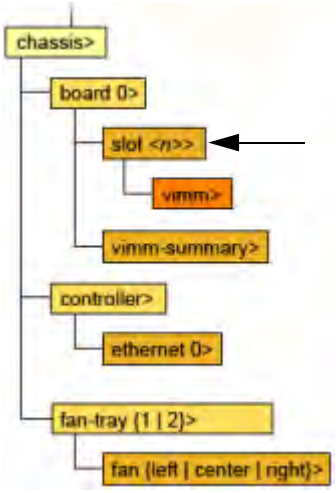


Figure D.4 Chassis>Board 0>Slot Context Commands

The table below describes the commands available at the Slot context level of the CLI.

Table D.4 Slot Context Commands

`context vimm`	Moves into the VIMM context level. See VIMM Context Commands on page 230.
`set led-test`	Initiates a functional test of the slot's LED.
`show led-state`	Displays the state of the slot's LED.

context vimm

Moves into the context level for the VIMM in the previously specified slot.

Syntax

`context vimm`

The system prompt changes to the following:

```
chassis board 0 slot n vimm>
```

Example

To move into the VIMM context level for slot 56, at the Slot 56 context prompt, type:

```
context vimm
```

The command displays information similar to the following:.

```
chassis board 0 slot 56> context vimm
chassis board 0 slot 56 vimm>
```

set led-test

Starts a functional test of the LED associated with the slot specified in the `context slot` command. The LED stays lit for two seconds, blinks fast for two seconds, blinks slowly for two seconds, then returns to the previous state.

Syntax

```
set led-test start
```

Example

To start a functional test of the LED associated with slot 56, at the Slot 56 context prompt, type:

```
set led-test start
```

The command displays information similar to the following:

```
chassis board 0 slot 56> set led-test start

led-test             start
```

show led-state

Displays the current status of the LED associated with the slot specified in the `context slot` command.

Syntax

```
show led-state
```

Example

To display the current status of the LED associated with slot 56, at the Slot 56 context prompt, type:

```
show led-state
```

The command displays information similar to the following:.

```
chassis board 0 slot 56> show led-state

led-state            on
```

VIMM Context Commands

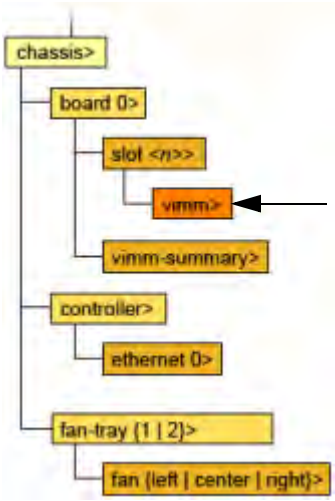


Figure D.5 Chassis>Board0>Slot >VIMM Context Commands

The table below describes the commands available at the VIMM context level of the CLI. Specify the VIMM number when moving into the Slot context level. See `context slot` on page 223.

Table D.5 VIMM Context Commands

Command	Description
`set admin-state`	Sets the administrative state of the VIMM.
`show`	Displays various VIMM information.

set admin-state

Sets the administrative state of the VIMM. When you change the state to `down`, you turn off power to the specific VIMM so it can be removed without electrical damage to the VIMM, the slot in which it is located, or the main board. The LED on the main board that is associated with the slot is then lit solid red to indicate that the VIMM can be removed safely. The LED turns off when the VIMM is removed.

Syntax

```
set admin-state {down | up}
```

Where:

`down`	Turns off power at the VIMM's slot.
`up`	Turns on power at the VIMM's slot and configures the VIMM as a spare.

WARNING! Before removing the VIMM, change the administrative state to down. If you fail to do so, the VIMM, the slot that it is in, or the main board may experience permanent electrical damage and cease to operate.

If a VIMM is an active member of a RAID group and its administrative state is set to down, a RAID group rebuild begins. If the VIMM is in a RAID group that cannot survive with the VIMM being taken out of the group, then data loss will occur.

show

Displays configuration information for the VIMM in the specified slot.

Syntax

```
show
```

Example

To display the configuration information for the flash VIMM in slot 56, at the VIMM context prompt, type:

```
show
```

The command displays information similar to the following:

```
chassis board 0 slot 56 vimm> show

admin-state          up
oper-state           up
vimm-state           active
raid-group           0
vimm-type            FLASH
mem-type             SLC-NAND
raw-capacity         68.7GB (64GiB)
raw-capacity-bytes   68,719,476,736
fmt-capacity         45.1GB (42GiB)
fmt-capacity-bytes   45,097,156,608
part-number          1000159A-B-P4
serial-number        18094R00000003
mfg-date             20090422
fw-date              Thu Feb 11 17:54:00 2010
fw-version           0x39df
sw-date              Fri Feb 12 00:07:00 2010
sw-version           0x39dd
is-programmed        true
id-assigned          true
```

```
environment
  temperature          66C  (OK)
  sensor-1.2v          1.14
  sensor-1.8v          1.79
  sensor-2.5v          2.42
  sensor-3.3v          3.35
run-time-stats
  run-time             2 years, 78 days 15:22:04
  stats-date           Wed Feb 17 10:37:39 2010
  format-date          Tue Feb 16 19:41:08 2010
  user-reads           130,233,145
  user-read-bytes      133,358,740,480
  user-writes          130,233,037
  user-write-bytes     133,358,629,888
  ecc-cor-counts
      one-bit              3
      two-bits             0
      three-bits           0
      four-plus-bits       0
      total-cor            3
  ecc-corrected        3          (rate: 2.30e-08)
  raid-corrected       0          (rate: 0.00e+00)
  blk-boot-fails       0
  blk-erase-fails      0
  blk-prog-fails       0
  blk-ecc-thresh       0
  blk-ecc-uncor        0
  erase-counts
  blk-erase-target     100,000
  blk-erase-avg        18.20
flash-health
  failed-blocks        342        (0.13%)
  failed-die           0          (0.00%)
  perform-thresh         0.95%    (OK)
  rebuild-thresh         0.64%    (OK)
  critical-thresh        0.48%    (OK)
```

VIMM-summary Context Commands

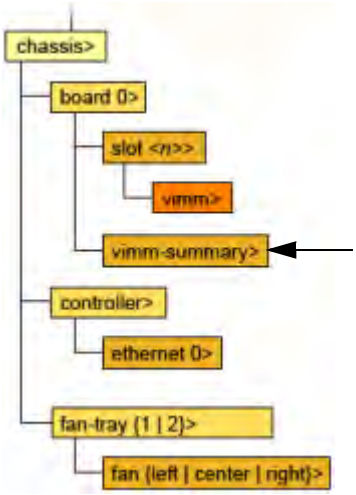


Figure D.6 Chassis>Board 0>VIMM-Summary Context Commands

The table below describes the commands available at the VIMM-summary context level of the CLI. Specify the VIMM number when moving into the Board 0 context level. See `context slot` on page 223.

Table D.6 VIMM-summary Context Commands

Command	Description
`show`	Displays various VIMM information.

show

Displays which VIMMs are present in the system, the corresponding slot ID numbers, and the VIMM type.

Syntax

`show`

Example

To display which VIMM locations are populated, at the VIMM-summary context prompt, type:

```
show vimm-summary
```

Under normal conditions for a fully-populated system, the command displays the following information:

```
chassis board 0> show vimm-summary

num-vimms             42
installed-vimm-ids    3-8,12-18,22-27,35,38-45,48,60,64-
69,71,75,76,78-80
flash-vimm-ids        3-8,12-18,22-27,35,38-45,48,60,64-
69,71,75,76,78-80
admin-down-vimm-ids   39
installed-mem-raw     2886.2GB (2688GiB)
usable-mem-raw        2199.0GB (2048GiB)
parity-mem-raw         549.8GB ( 512GiB)
spare-mem-raw           68.7GB (  64GiB)
unavailable-mem-raw     68.7GB (  64GiB)
formatted-percentage  78.1%
usable-mem-formatted  1718.0GB (1600GiB)
```

The following example shows a system that is experiencing errors.

```
chassis board 0> show vimm-summary

num-vimms            42
installed-vimm-ids   0-41
flash-vimm-ids        0-41
admin-down-vimm-ids  37
installed-mem-raw     1894.1GB (1764GiB)
usable-mem-raw        1443.1GB (1344GiB)
parity-mem-raw         360.8GB ( 336GiB)
spare-mem-raw           90.2GB (  84GiB)
unavailable-mem-raw     42.2GB (  40GiB)
formatted-percentage   78.1%
usable-mem-formatted  1126.9GB (1000GiB)
admin-down-vimm-ids  68,72,80
isolated-vimm-ids    76
```

The command lists the following information:

Table D.7 show vim-summary Command Output Descriptions

Output	Description
`num-vimms`	Indicates the number of VIMMs physically installed in the system.
`installed-vimm-ids`	Indicates the IDs of the VIMMs that are physically present.
`flash-vimm-ids`	Indicates the IDs of the flash VIMMs that are physically present.
`admin-down-vimm-ids`	Indicates the IDs of the VIMMs that have been administratively taken out-of-service through the user interface.

Table D.7 show vim-summary Command Output Descriptions

Output	Description
`oper-down-vimm-ids`	Indicates the IDs of the VIMMs that have been operationally taken out-of-service by the system.
`isolated-vimm-ids`	Indicates the IDs of the VIMMs that are isolated due to either improper placement in a partially-populated chassis or through multiple VIMM failures
`installed-mem-raw`	Indicates, in GB, the amount of raw memory installed. **Note:** This is not necessarily the amount of usable memory as some memory is reserved for spares and RAID support.
`usable-mem-raw`	Indicates, in GB, the amount of usable memory advertised to the host.
`parity-mem-raw`	Indicates, in GB, the amount of memory dedicated to RAID parity.
`spare-mem-raw`	Indicates, in GB, the amount of spare memory ready to be used in case of a VIMM failure.
`unavailable-mem-raw`	Indicates, in GB, the amount of memory that is installed but unusable. This represents VIMMs that are administratively out-of-service, failed, or isolated.
`formatted-percentage`	Indicates the percentage of flash VIMMs that have been formatted.
`usable-mem-formatted`	Indicates the amount of flash VIMMs that have been formatted.

Controller Context Commands

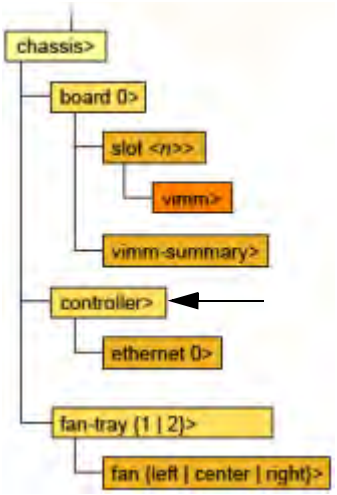


Figure D.7 Chassis>Controller Context Commands

The table below describes the commands available at the Controller context sublevel of the CLI.

Table D.8 Controller Context Commands

Command	Description
`context ethernet 0`	Moves the user to the Ethernet 0 context level. See Ethernet 0 Context Commands on page 238.
`set serial-speed`	Sets the speed of the serial port.
`show serial-speed`	Shows the speed of the serial port.

set serial-speed

Sets the speed of the serial port to either 9600 or 115200.

After the changing the serial-speed setting, reboot the Memory Array.

Syntax

```
set serial-speed {9600 | 115200}
```

show serial-speed

Shows the speed of the serial port at either 9600 or 115200.

Syntax

```
show serial-speed
```

context ethernet 0

Moves into the Ethernet 0 context level.

Syntax

```
context ethernet 0
```

The system prompt changes to the following:

```
chassis controller ethernet 0>
```

Ethernet 0 Context Commands

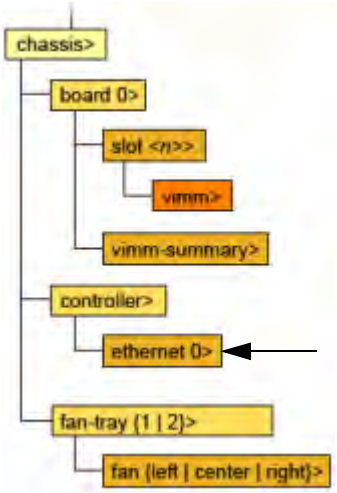


Figure D.8 Chassis>Controller>Ethernet Context Commands

The table below describes the commands available at the Ethernet 0 context sublevel of the CLI.

Table D.9 Controller Context Commands

Command	Description
`set dhcp`	Enables or disables using DHCP to automatically set the system's IP address.
`set ip-address`	Manually sets the IP address of the system.
`clear ip-address`	Clears the provisioned ip/netmask/gateway to use when DHCP is disabled.
`set dns-config`	Sets the current DNS configuration type of the system when DHCP has been enabled.
`set dns-nameserver`	Sets the IP address for the DNS server to use when `dns-config` is set to manual.
`set dns-search`	Sets the DNS search server.
`clear dns-nameserver`	Clears the current DNS name server.
`clear dns-search`	Clears the current DNS search server.
`show`	Displays information about the Ethernet port.
`reset`	Resets the Ethernet port.

set dhcp

Enables or disables using DHCP to automatically set the system's IP address.

Syntax

```
set dhcp {enabled | disabled}
```

Where:

`enabled`	Enables using DHCP to automatically set the system's IP address.
`disabled`	Disables using DHCP to automatically set the system's IP address.

Use the `save config` command to save the changes across system reboots.

set ip-address

Manually sets the IP address of the system.

Syntax

```
set ip-address <ipaddr>[:<netmask>[:<gateway>]]
```

Where:

ipaddr	Specifies the system's new IP address.
netmask	Optional. Specifies the system's new netmask.
gateway	Optional. Specifies the system's new gateway address.

Use the `save config` command to save the changes across system reboots.

clear ip-address

Clears the provisioned ip/netmask/gateway to use when DHCP is disabled.

Syntax

```
clear ip-address
```

Use the `save config` command to save the changes across system reboots.

set dns-config

Sets the current DNS configuration type of the system when DHCP has been enabled. Set the DNS configuration type either manually or automatically.

Syntax

```
set dns-config {manual | auto}
```

Where:

`manual`	Sets the DNS to manual configuration.
`auto`	Sets the DNS to automatic configuration.

Use the `save config` command to save the changes across system reboots.

set dns-nameserver

Provisions the IP address for the DNS server to use when the `set dns-config` command is set to `manual`.

Syntax

```
set dns-nameserver <ipaddr>
```

Where:

ipaddr	The DNS server's IP address.

Use the `save config` command to save the changes across system reboots.

clear dns-nameserver

Clears the provisioned DNS server address to be used when the `set dns-config` command is set to `manual`.

Syntax

```
clear dns-nameserver
```

Use the `save config` command to save the changes across system reboots.

set dns-search

Provisions domain name for host-name lookup, to be used when the `set dns-config` command is set to `manual`.

Syntax

```
set dns-search <value>
```

Where:

value	The local domain name.

Use the `save config` command to save the changes across system reboots.

clear dns-search

Clears the provisioned domain name.

Syntax

`clear dns-search <value>`

Use the `save config` command to save the changes across system reboots.

show

Displays the IP, netmask, gateway, and MAC addresses of the Memory Array.

Syntax

`show`

Example

To display the system Ethernet information, at the Controller context prompt, type:

```
show
```

The command displays information similar to the following:

```
chassis controller ethernet 0> show

dhcp                enabled
ip-address          10.10.0.125
netmask             255.255.255.0
gateway             10.10.0.1
mac-address         00:1B:97:00:00:05
dns-config          automatic
dns-nameserver      10.10.0.2
dns-search          violintech.net
provisioned-info
    prov-ip-address     192.168.1.2
    prov-netmask        255.255.255.0
```

reset

Resets the Ethernet port.

Syntax

```
reset
```

Example

To reset the Ethernet port, at the Controller context prompt, type:

```
reset
```

WARNING! If the Ethernet port is reset while logged in vial Telnet or SSH, then the CLI session will be lost. Run this command only when running the CLI from the serial/console port.

Fan-tray Context Commands

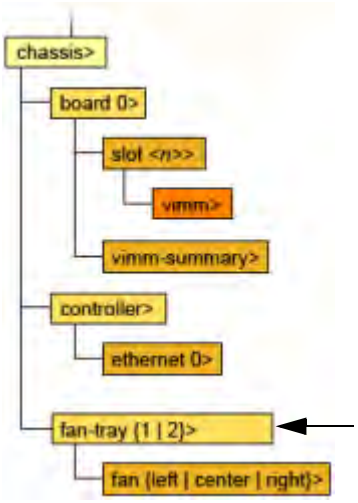


Figure D.9 Chassis>Fan Tray Context Commands

The table below describes the commands available at the Fan-tray context level of the CLI. Access the Fan-tray context level through the Chassis context level. See Chassis Context Commands on page 221.

Table D.10 Fan-tray Context Commands

Command	Description
`context fan`	Moves into the Fan context level. See Fan Context Commands on page 244.

context fan

Moves into the context level for the specified fan. The fans are labeled from left to right when facing the chassis.

Syntax

```
context fan {left | center | right}
```

Where:

`left`	Moves the user into the context level for the left fan.
`center`	Moves the user into the context level for the center fan.
`right`	Moves the user into the context level for the right fan.

The system prompt changes similar to the following.

```
chassis fan-tray 1 fan left>
```

Fan Context Commands

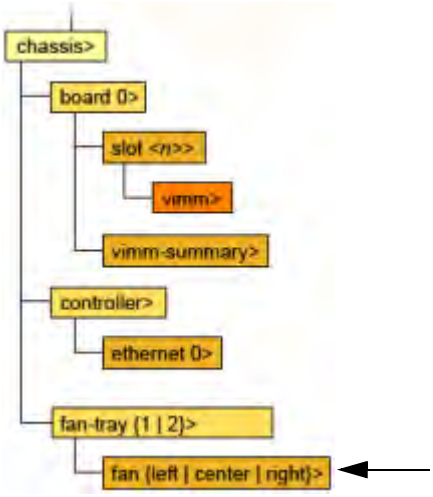


Figure D.10 Chassis>Fan-Tray>Fan Context Commands

The table below describes the commands available at the Fan context level of the CLI. Access the Fan context level through the Fan-tray context level. See Fan-tray Context Commands on page 243.

Table D.11 Fan Context Commands

Command	Description
show	Displays the current fan speed and rpm.

show

Displays the current speed setting of the fan.

Syntax

show

The command displays text similar to the following:.

```
chassis fan-tray 1 fan left> show

speed                high
rpm                  4650
```

CLI Context Commands

Figure D.11 CLI Context Level

The table below describes the commands available at the CLI context level of the CLI.

Table D.12 CLI Context Commands

Command	Description
`set columns`	Sets the number of columns in the display window.
`set edit-mode`	Sets the command line edit mode.
`set history-size`	Sets the size of the history buffer.
`set idle-timeout`	Sets the time, in minutes, before exiting due to user inactivity.
`set lines`	Sets the number of lines in the display window.
`set pagination`	Enables/disables pagination in the display window.
`show columns`	Displays the number of columns in the display window.
`show edit-mode`	Displays the command line edit mode.
`show history-size`	Displays the size of the history buffer.
`show idle-timeout`	Displays the time, in minutes, before exiting due to user inactivity.
`show lines`	Displays the number of lines in the display window.
`show pagination`	Displays the pagination mode of the display window.
`show session`	Shows the `oam_cli` session.
`cancel session`	Cancels the `oam_cli` session.

set columns

Sets the number of columns in the display window.

Syntax

`set columns <`*n*`>`

Where:

n — The number of columns to set the display window to, which is an integer in the range of 80-200.

set edit-mode

Sets the command line editing mode to `vi` or `emacs`.

Syntax

```
set edit-mode {vi | emacs}
```

Where:

`vi`	Sets the command line editing mode to `vi`.
`emacs`	Sets the command line editing mode to `emacs`.

set history-size

Sets the history buffer to the specified size.

Syntax

```
set history-size <n>
```

Where:

n	The number of lines to set for the history buffer. Valid values are in the range of 10-1000.

set idle-timeout

Sets the time, in minutes, before exiting due to user inactivity.

Syntax

```
set idle-timeout <n>
```

Where:

n	An integer between 0 and 1440, where 0 means never.

set lines

Sets the window size to the specified number of lines.

Syntax

```
set lines <n>
```

Where:

n	The number of lines for the window size. Valid values are in the range of 10-100.

set pagination

Enables or disables the pagination in the current CLI window. Enabling pagination is helpful when using the `show log` command because of the long output.

Syntax

```
set pagination {on | off}
```

Where:

`on`	Enables the pagination setting of the display window.
`off`	Disables the pagination setting of the display window.

The pagination controls are listed in the table below:

Table D.13 Pagination Controls

Key	Description
return	Print the next line.
space	Print the next page.
1	Return to the first page of file.
$	Go to the last page of file.
b or ^B	Go back one page.
q or e	Quit the paginator.
h or ?	Print this help message.

show columns

Displays the number of columns in the display window.

Syntax

```
show columns
```

The command displays information similar to the following:.

```
cli> show columns

columns              80
```

show edit-mode

Displays the current command line editing mode.

Syntax

```
show edit-mode
```

The command displays information similar to the following:

```
cli> show edit-mode

edit-mode            vi
```

show history-size

Displays the current size of the history buffer.

Syntax

```
show history-size
```

The command displays information similar to the following:

```
cli> show history-size

history-size         100
```

show idle-timeout

Displays the time, in minutes, before exiting due to user inactivity.

Syntax

```
show idle-timeout
```

The command displays information similar to the following:

```
cli> show idle-timeout

idle-timeout          30 minutes
```

show lines

Shows the number of rows for the display window.

Syntax

`show lines`

The command displays information similar to the following:

```
cli> show lines

lines                 24
```

show pagination

Displays the pagination setting for the display window, which can be `on` or `off`.

Syntax

`show pagination`

The command displays information similar to the following:.

```
cli> show pagination

pagination            on
```

show session

Displays the Operation, Administration, and Maintenance (OAM) `oam_cli` session.

Syntax

`show session <n>`

The command displays information similar to the following:.

```
cli> show session

Session ID  Terminal  Active Since   Source
----------  --------  -------------  ----------
97          pts/0     Jun 24 09:59   10.10.0.113      Current cli session
```

cancel session

Cancels the `oam_cli` session.

Syntax

```
cancel session
```

RAID Context Commands

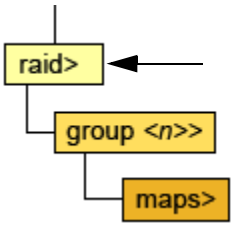


Figure D.12 RAID Context Level

The table below describes the commands available at the RAID context sublevel of the CLI.

Table D.14 RAID Context Commands

Command	Description
`context group`	Moves the user into the context level for the specified RAID group. See RAID Group Context Commands on page 253.
`show spare-ids`	Displays the IDs of the spare VIMMs in a system.

context group

Moves into the context level for the specified RAID group.

Syntax

`context group <n>`

Where:

n Specifies the RAID group. Valid values are in the range of 0-15, inclusively.

The system prompt changes to the following:

```
raid group n>
```

Example

To move into the context level for RAID group 5, at the RAID context prompt, type:

```
context group 5
```

The command displays information shown below:.

```
raid> context group 5
raid group 5>
```

show spare-ids

Displays the IDs of the spare VIMMs in a Memory Array. These spares are used during RAID group rebuilding when a VIMM becomes unstable and is moved out of service.

Syntax

`show spare-ids`

The command displays the information shown below:

```
raid> show spare-ids

spares               30,31,32,52
```

If no spares are available, then the following is displayed:

```
raid> show spare-ids

spares               none
```

RAID Group Context Commands

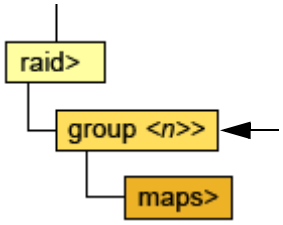


Figure D.13 RAID>Group Context Level

The table below describes the commands available at the RAID Group context sublevel of the CLI. Access the RAID Group context sublevel through the RAID context level. See RAID Context Commands on page 251.

Table D.15 RAID Group Context Commands

Command	Description
`context maps`	Moves the user into the context level for the RAID group mapping. See Maps Context Commands on page 255.

context maps

Moves into the context level for the Maps group.

Syntax

`context maps`

The system prompt changes to the following:

```
raid group n maps>
```

Where:

n	Specifies the RAID group number in the range of 0-15, inclusively.

Example

To move into the Maps context level for RAID group 5, at the RAID context prompt, type:

```
context group 5 maps
```

The command displays the following information:

```
raid> context group 5 maps
raid group 5 maps>
```

Maps Context Commands

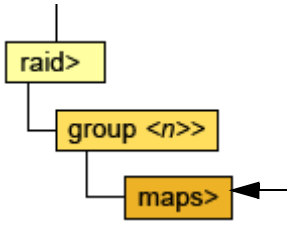


Figure D.14 RAID>Group>Maps Context Level

The table below describes the commands available at the Maps context sublevel of the CLI. Access the Maps context sublevel through the RAID Group context level. See RAID Group Context Commands on page 253.

Table D.16 Maps Context Commands

Command	Description
show	Displays information about the VIMMs in the specified RAID group.

show

Displays the VIMM mapping for the specified RAID group. Four VIMMs in a RAID group contain data and one contains parity information. Each RAID group can tolerate a single VIMM failure with no loss of data.

Syntax

```
show
```

Example

To display the VIMM mapping information for RAID group 4, at the Maps context prompt, type:

```
show
```

The command displays information similar to the following:

```
raid group 4 maps> show

group-number          4
id                    19,46,35,73,56
state                 data,data,data,data,data
```

Where:

`group-number`	Indicates the RAID group ID. The valid range of values is 0-15, inclusively.
`id`	Indicates the physical VIMM ID. The valid range of values is 0-83, inclusively.
`state`	Indicates the state of each VIMM in the 5-VIMM RAID group. Valid values are: • `data`—VIMM is being used for data, either user data or parity data. • `REBUILDING`—VIMM is currently being rebuilt by the RAID engine to recover from a prior failure. • `FAULT`—A fault has occurred for this VIMM. If a spare is available, a rebuild occurs for this virtual VIMM.

System Context Commands

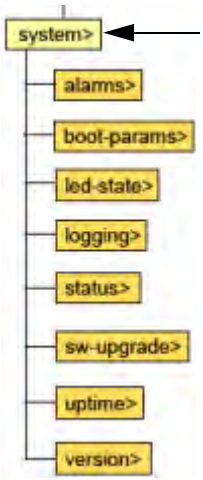


Figure D.15 System Context Level

The table below describes the commands available at the System context level of the CLI.

Table D.17 System Context Commands

Command	Description
`cancel reboot`	Cancels the scheduled reboot.
`clear log`	Clears the log buffer.
`context alarms`	Moves into the Alarms context level. See Alarms Context Commands on page 273.
`context all`	Moves into the all context level.
`context boot-params`	Moves into the boot-params context level.
`context led-state`	Moves into the LED State context level. See LED-state Context Commands on page 277.
`context logging`	Moves into the Logging context level. See Logging Context Commands on page 279.
`context oam`	Moves into the oam context level
`context status`	Moves into the Status context level. See Status Context Commands on page 290.
`context sw-upgrade`	Moves into the Sw-upgrade context level. See Sw-upgrade Context Commands on page 294.
`context uptime`	Moves into the Uptime context level. See Uptime Context Commands on page 297.
`context version`	Moves into the Version context level. See Version Context Commands on page 298.
`save log`	Saves the system log to a host.

Table D.17 System Context Commands *(Continued)*

Command	Description
`save config`	Commits the admin login password and system log service changes to the flash or reverts back to the factory default settings. If the changes are not committed before the system is rebooted, then the changes are lost and the previous settings are used.
`set admin`	Changes the password for the admin login.
`set boot-params`	Sets the systems boot parameters.
`set clock`	Sets the date/time in ISO-8601 format: `yyyy-mm-ddThh:mm:ss`.
`set clock-source`	Sets the clock source for the system.
`save config`	Saves system changes to the flash.
`restore config`	Reverts back to factory settings.
`set led-test`	Initiates a functional test of the system's LEDs.
`set name`	Sets the name of the Memory Array.
`show boot-params`	Displays the systems boot parameters.
`show clock`	Displays the system date and time.
`show clock-source`	Displays the current clock source for the system.
`show log`	Displays the log buffer.
`show messages`	Displays the `/var/log/messages` file.
`show name`	Displays the name of the Memory Array.
`show reboot`	Displays when the scheduled reboot will take place.
`show status`	Displays the status of various software modules.

cancel reboot

Cancels a currently scheduled reboot.

Syntax

```
cancel reboot
```

clear log

Clears the system log.

Syntax

```
clear log
```

Example

To clear the system log, at the System context prompt, type:

```
clear log
```

The command displays the following information:.

```
system> clear log

log                  clear
```

context alarms

Moves into the Alarms context level to access the alarm related commands.

Syntax

```
context alarms
```

The system prompt changes to the following:

```
system alarms>
```

context all

Moves into the all context level to reboot all system processors.

Syntax

```
context all
```

The system prompt changes to the following:

```
system all>
```

context boot-params

Moves into the boot-param context level to access system boot parameters.

Syntax

```
context boot-params
```

The system prompt changes to the following:

```
system boot-params>
```

context led-state

Moves into the LED State context level to access the LED state related commands.

Syntax

```
context led-state
```

The system prompt changes to the following:

```
system led-state>
```

context logging

Moves into the Logging context level to access the logging related commands.

Syntax

```
context logging
```

The system prompt changes to the following:

```
system logging>
```

context oam

Moves into the OAM context level to reboot OAM processor.

Syntax

```
context oam
```

The system prompt changes to the following:

```
system oam>
```

context status

Moves into the system Status context level to access the system status related commands.

Syntax

```
context status
```

The system prompt changes to the following:

```
system status>
```

context sw-upgrade

Moves into the software upgrade context level to access the software upgrade commands.

Syntax

```
context sw-upgrade
```

The system prompt changes to the following:

```
system sw-upgrade>
```

context uptime

Moves into the Uptime context level to access operational time related commands.

Syntax

```
context uptime
```

The system prompt changes to the following:

```
system uptime>
```

context version

Moves into the Version context level to access software version related commands.

Syntax

```
context version
```

The system prompt changes to the following:

```
system version>
```

save log

Saves the system log to a remote host using either TFTP or SCP.

Syntax

```
save log {<user>@scp | tftp}://<hostname>/system.log
```

Where:

user@scp	Specifies to use SCP and the user name to log onto the host when using SCP.
tftp	Specifies to use TFTP.
hostname	Specifies the host name to copy the system log to.

When using SCP, you will be prompted for the user's password before the copy process starts.

set admin

Changes the default password for the admin login that is accessed from the System context level. The admin password must meet the following requirements.

- Have a length between 6-12 alphanumeric characters. If six characters are used, then you must mix upper/lower case letters with numbers or punctuation.
- Be a combination of upper and lower case letters and numbers.
- Cannot be similar to a previous password.
- Cannot be a palindrome.

If you specify an unacceptable password, you will get a message that the password is *too simple*. By increasing the length of the password, you can use all lower case or all upper case characters. Essentially, the longer the password, the less complicated it needs to be.

Syntax

`set admin <password>`

You will be prompted to enter a new password. If the new password meets the requirements you will be prompted to re-enter the same password. A message appears indicating that the password has been changed.

The command displays information similar to the following if the new password does not meet the requirements.

```
system> set admin foobar
Changing password for admin
Enter the new password (minimum of 6, maximum of 12 characters)
Please use a combination of upper and lower case letters and
numbers.
Enter new password:
Bad password: too simple.
passwd: The password for admin is unchanged.
```

The password remains unchanged if the new one does not meet the requirements. You cannot reset the password back to the default password for the admin user.

Use the `save config` command to save the changes across system reboots.

set clock

Sets the system date and time.

Syntax

`set clock <yyyy-mm-dd>T<hh:mm:ss>`

Where:

yyyy	The 4-digit year.
mm	The 2-digit month. Valid values are 01 to 12.
dd	The 2-digit day. Valid values are 01 to 31.
T	The delineator between the date and the time.
hh	The 2 digit hour. Valid values are 00 to 23.
mm	The 2-digit minutes. Valid values are 00 to 59.
ss	The 2-digit seconds. Valid values are 00 to 59.

set boot-params

Sets the system boot parameters.

Syntax

```
set boot-params stagger-mem-clear <value>
```

Where

value	Is either `enable` or `disable`.

set clock-source

Sets the system clock source. The source can be set to the host computer or the Memory Array. The system clock only keeps a running count of the number of seconds that the system has been operational. It doesn't keep an accurate calendar date and time. If the system is rebooted, then the elapsed time is not accounted for when the system finishes the reboot process and is again operational.

Syntax

```
set clock-source {host | local}
```

Where:

`host`	Sets the clock source to the host computer. This is the default value.
`local`	Sets the clock source to the Memory Array.

save config

Commits the admin login password and system log service changes to flash or reverts back to the factory default settings. If the changes are not committed before the system is rebooted, then the changes are lost and the previous settings are used.

Syntax

```
save config
```

The command displays information similar to the following:.

```
system> save config

Config operation succeeded.
Validity check succeeded.
```

restore config

Restores the admin login password and system log service configuration changes back to the factory default settings. Requires a software reboot.

Syntax

```
restore config factory
```

The command displays information similar to the following:.

```
system> restore config factory

Running this command requires a non service-affecting software reboot.
All OAM-CLI sessions will be terminated.

Would you like to apply the changes (Y/N)?
```

set led-test

Starts a functional test of the system LEDs.

Syntax

```
set led-test start
```

Example

To start a functional test of the system LEDs, at the System context prompt, type:

```
set led-test start
```

The command displays information similar to the following:.

```
system> set led-test start

led-test            start
```

set name

Sets the hostname of the system. When setting the system's name, use only alphanumeric characters and the hyphen.

Syntax

`set name <name>`

Where:

name	Specifies the new name for the system.

Use the `save config` command to save the changes across system reboots.

show boot-params

Displays the system boot parameters.

Syntax

`show boot-params stagger-mem-clear`

The command displays information similar to the following:.

```
system> show boot-params stagger-mem-clear

stagger-mem-clear                enabled
```

show clock

Displays the current time and date of a Memory Array.

Syntax

`show clock`

The command displays information similar to the following:

```
system> show clock

clock                2007-09-24T23:59:58
```

Where:

`clock`	Displays the date and time in the format *yyyy-mm-dd*T*hh:mm:ss*. The T is a delineator between the date and the time.

show clock-source

Displays the current clock source of a Memory Array. The source can be the host of the system or local, which defines the clock source as the Memory Array.

Syntax

```
show clock-source
```

The command displays information similar to the following:.

```
system> show clock-source

clock-source         host
```

Where:

`host`	Indicates that the clock source is derived from the host PC. This is the default value.
`local`	Indicates that the clock source is derived from the Memory Array.

show log

Displays the current entries in the log buffer. The display of the log is controlled by whether pagination has been enabled or not in the current CLI session. See set pagination on page 247 for more information.

Syntax

```
show log
```

The command displays information similar to the following:

```
system> show log

xxx xx xx:xx:xx [000000000] INFO vtu_log_init(): ------------ LOG RESTART ------------
xxx xx xx:xx:xx [000000010] INFO ecpu_hwmgr_init(): Running fans at full speed
xxx xx xx:xx:xx [000000010] INFO main(): Main controller build ID: 12954
xxx xx xx:xx:xx [000000010] INFO main(): S/W Rel: Release Number, Built: Date 12:16:39 on
swbuild.violintech.net by user common
```

show messages

Displays the current contents of the `/var/log/messages` file. The embedded operating system running on the Memory Array produces a message log typical to the `/var/log/messages` file found on Linux operating systems. The message log file created on the Memory Array contains system log and typical boot-up messages in addition to any `set` CLI commands that are run on the system.

Syntax

```
show messages
```

Example

To display the log messages, at the System context prompt, type:

```
show messages
```

The command displays information similar to the following:.

```
system> show messages

Date 00:28:22 kernel: Linux version Number (common@swbuild.violintech.net)
(gcc version 3.4.6) #2 PREEMPT Mon Date 12:38:51 EST
Date 00:28:22 kernel: ^O^M
Date 00:28:22 kernel:
Date 00:28:22 kernel: uClinux/Nios II
Date 00:28:22 kernel: Altera Nios II support (C) 2004 Microtronix Datacom Ltd.

Date 00:28:22 kernel: On node 0 totalpages: 32512
Date 00:28:22 kernel:   DMA zone: 32512 pages, LIFO batch:7
Date 00:28:22 kernel: Built 1 zonelists
Date 00:28:22 kernel: Kernel command line: CONSOLE=/dev/ttyS0 root=/dev/ram0 r
w panic=10 mtdparts=violin-0:256k(BOOTROM)ro,128k(ENV1),128k(ENV2),1536k(FLATFS3)
,32m(UPGRADE),8m(CPLgold)ro,16m(OAMgold)ro,6016k(SPARE) oeth_mac=00:1b:97:00:00:86
Date 00:28:22 kernel: PID hash table entries: 512 (order: 9, 2048 bytes)
Date 00:28:22 kernel: Dentry cache hash table entries: 16384 (order: 4, 65536 bytes)
Date 00:28:22 kernel: Inode-cache hash table entries: 8192 (order: 3, 32768 bytes)
Date 00:28:22 kernel: Memory available: 122496k/130048k RAM, 0k/0k ROM (1707k
kernel code, 4607k data)
```

show name

Displays the current hostname of the system.

```
show name
```

Example

To display the current hostname, at the System context prompt, type:

```
show name
```

The command displays information similar to the following:

```
system> show name

name    Violin
```

show reboot

Displays when the scheduled reboot will run.

Syntax

```
show reboot
```

The command displays information similar to the following:

```
system> show reboot

There is a reboot scheduled in 14 minute(s) and 8 seconds.
```

show status

Displays the status of the various software modules and the validity of the current VIMM configuration.

Syntax

```
show status
```

The command displays information similar to the following when the system is operating correctly:

```
system> show status

alarm-mgr            running
data-mgr             running
diagnostics-mgr      running
hardware-mgr         running
inventory-mgr        running
raid-mgr             running
vimm-mon             running
data-plane           available
raid-rebuild         active (group 2, vimm 07, 47% complete)
vimm-config          out-of-spec-42-vimm
admin-down-vimm-ids  60
missing-vimm-ids     15
host-interfaces
    slot                 port-1
    state                enabled
    protocol             pcie
    link-width           4
    neg-link-width       4
    max-data-rate        10 Gb/s
    cfg-data-rate        10 Gb/s
    host                 detected

    slot                 port-2
    state                enabled
    protocol             pcie
    link-width           4
    neg-link-width       4
    max-data-rate        10 Gb/s
    cfg-data-rate        10 Gb/s
    host                 detected

    slot                 port-0
    state                disabled
    host                 undetected
```

The command displays information similar to the following when failed VIMMs are in the system:

```
system> show status

alarm-mgr            running
data-mgr             running
diagnostics-mgr      running
hardware-mgr         running
inventory-mgr        running
raid-mgr             running
vimm-mon             running
data-plane           available
raid-rebuild         active (group 2, vimm 07, 47% complete)
vimm-config          out-of-spec-42-vimm
failed-vimm-ids      32, 61
admin-down-vimm-ids  60
missing-vimm-ids     15
host-interfaces
    slot                 port-1
    state                enabled
    protocol             pcie
    link-width           4
    neg-link-width       4
    max-data-rate        10 Gb/s
    cfg-data-rate        10 Gb/s
    host                 detected

    slot                 port-2
    state                enabled
    protocol             pcie
    link-width           4
    neg-link-width       4
    max-data-rate        10 Gb/s
    cfg-data-rate        10 Gb/s
    host                 detected

    slot                 port-0
    state                disabled
    host                 undetected
```

Alarms Context Commands

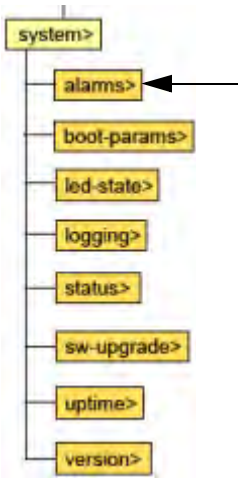


Figure D.16 System>Alarms Context Level

The table below describes the commands available at the Alarms context sublevel of the CLI. Access the Alarms context sublevel through the System context level. See System Context Commands on page 257.

Table D.18 Alarms Context Commands

Command	Description
show	Displays the current alarms on the system.

show

Displays the current alarms on a Memory Array. The following are possible alarms:

- Lid has been removed
- Fan tray has been removed
- Fan is not operating at its correct speed
- VIMM is experiencing low voltage
- VIMM is over the maximum allowable temperature

Syntax

show

Example

To display the current alarms on a system, at the Alarms context prompt, type:

```
show
```

The command displays information similar to the following:

```
system alarms> show

alarm1               System booting (45% complete)
alarm2               Lid removed
alarm3               Top fan tray removed
alarm4               Bottom-left fan running too slowly, 2000 RPM
alarm5               VIMM 14 low 1.8V, 1.68 volts; VIMM shut down
alarm6               VIMM 68: hot, 71 C
```

The command displays information similar to the following during a VIMM flash format.

```
> show system alarms

alarm1Data plane disabled
alarm2Scheduler paused
alarm3VIMM flash format in progress (2% complete)
alarm4VIMM configuration OUT OF SPEC, 2 missing, 0 failed from 5 VIMM system
alarm5CPL IRQs on VIMM 13: 0x00000c00
alarm6CPL IRQs on VIMM 15: 0x00000c00
alarm7CPL IRQs on VIMM 16: 0x00000400
```

Boot-params Context Level

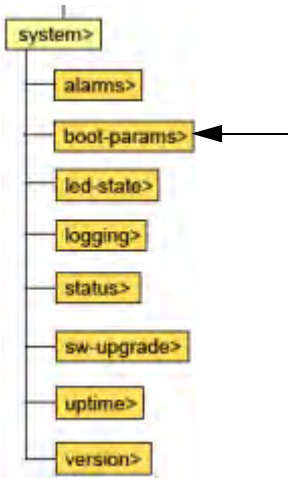


Figure D.17 System>Boot-params Context Level

The table below describes the commands available at the Boot-params context sublevel of the CLI.

Table D.19 Boot-params Context Commands

Command	Description
`set stagger-mem-clear`	Enables or disables the staggered VIMM boot-up process.
`show stagger-mem-clear`	Displays the current state of the VIMM boot-up process.

set stagger-mem-clear

Enables or disables the staggered VIMM boot-up process. When enabled, the VIMMs boots up in a staggered sequence upon a system reboot.

Syntax

```
set stagger-mem-clear {disabled | enabled}
```

Example

To enable the staggered VIMM boot-up process, at the Boot-params context prompt, type:

```
set stagger-mem-clear enabled
```

show stagger-mem-clear

Displays the current state of the VIMM boot-up process.

Syntax

```
show stagger-mem-clear
```

Example

To display the current state of the VIMM boot-up process, at the Boot-params context prompt, type:

```
show stagger-mem-clear
```

The command displays information similar to the following:

```
system boot-params> show stagger-mem-clear

stagger-mem-clear    enabled
```

LED-state Context Commands

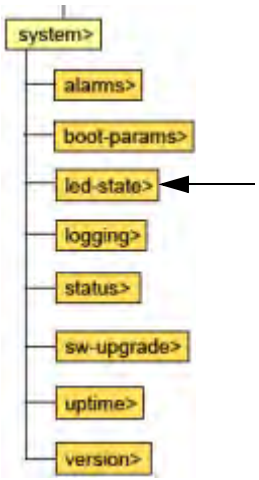


Figure D.18 System>LED-State Context Level

The table below describes the commands available at the LED State context sublevel of the CLI. Access the LED State context sublevel through the System context level. See System Context Commands on page 257.

Table D.20 LED State Context Commands

Command	Description
show	Displays the current status of the system LEDs.

show

Displays the current status of the system LEDs.

Syntax

```
show
```

Example

To display the current status of the system LEDs, at the LED State context prompt, type:

```
show
```

The command displays information similar to the following:

```
system led-state> show

power-a              on
power-b              on
status               on
alarm                off
```

Logging Context Commands

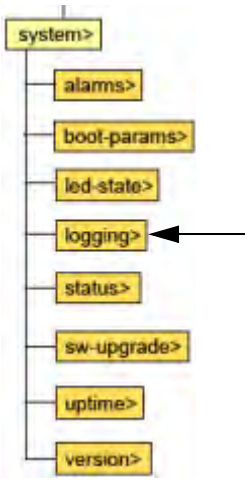


Figure D.19 System>Logging Context Level

The table below describes the commands available at the Logging context sublevel of the CLI. Access the Logging context sublevel through the System context level. See System Context Commands on page 257.

Table D.21 Logging Context Commands

Command	Description
`context in-memory`	Moves into the In-memory context level. See In-memory Context Commands on page 281.
`context syslog`	Moves into the Syslog context level. See Syslog Context Commands on page 287.

context in-memory

Moves into the In-memory context level to access the message category related commands.

Syntax

```
context in-memory
```

Where:

`context in-memory`	Moves the user into the In-memory context level.

The system prompt changes to the following:

```
system logging in-memory>
```

context syslog

Moves into the Syslog context level to access the syslogd related commands.

Syntax

```
context syslog
```

Where:

`context syslog`	Moves into the Syslog context level.

The system prompt changes to the following:

```
system logging syslog>
```

In-memory Context Commands

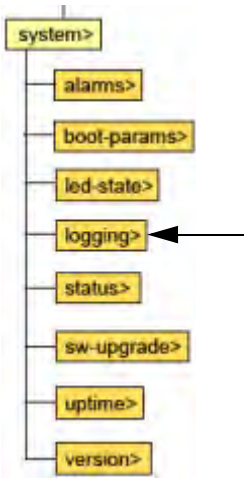


Figure D.20 System>Logging>In-Memory Context Level

The table below describes the commands available at the In-memory context sublevel of the CLI. Access the In-memory context sublevel through the Logging context level. See Logging Context Commands on page 279.

Table D.22 In-memory Context Commands

Command	Description
`context category`	Moves into the Category context level. See Category Context Commands on page 285.
`set default-level`	Sets the default logging level for all message categories.
`show default-level`	Displays the default logging level for all message categories.

context category

Moves into the Category context level to access the message category related commands.

Syntax

`context category <category_name>`

Where:

`category_name`	The Category context level. See Table D.23 below for the list of valid message categories.

Table D.23 Message Categories

Category	Description
alarm-mgr	Alarm Manager
bare-mgr	Backup and Restore Manager
circqueue	Circular Queue
cmpl-bintree	Complete Binary tree implementation
ctpl	Control Plane
ctpl-tree	Tree construction logic in control plane
data-mgr	Data Manager
diag-mgr	Diagnostics Manager
dispatcher	Message Dispatcher
dtl	Data Transport Layer
ecpu	Embedded CPU
hal	Hardware Abstraction Layer
hw-mgr	Hardware Manager
inv-mgr	Inventory Manager
pcblayout	PCB Layout
perf-mon	Performance Monitor
portstatus	VIMM Port Status
priq	Priority Queue
rbtree	Red-Black tree implementation
reg-read	Register Writes
reg-write	Register Reads
sys-mgr	System Manager
topology	Topology
trigger	Trigger Routines
util	Utilities
vtsim	Violin Technologies Simulator

Example

When navigating to the `util` category context level, the system prompt changes to the following:

```
system logging in-memory category util>
```

set default-level

Sets the level of messages stored in the system log of the Memory Array. The message level can be set to:

- DEBUG
- INFO
- WARN
- ERROR
- FATAL

Setting the level to debug may fill up the log very quickly since this level logs every internal message created by the system.

Syntax

```
set default-level {default | fatal | error | warn | info
| debug}
```

Where:

`default`	The default value, which is currently `info`.
`fatal`	Sets the system default message level to fatal.
`error`	Sets the system default message level to error.
`warn`	Sets the system default message level to warn.
`info`	Sets the system default message level to info. This is the default value.
`debug`	Sets the system default message level to debug (all system messages). This generates a large number of system messages.

show default-level

Displays the default logging level of messages stored in the system log of the Memory Array. The message logging level can be set to:

- DEBUG
- INFO
- WARN
- ERROR
- FATAL

Syntax

`show default-level`

The command displays information similar to the following:

```
system logging in-memory> show default-level

default-level        info
```

Category Context Commands

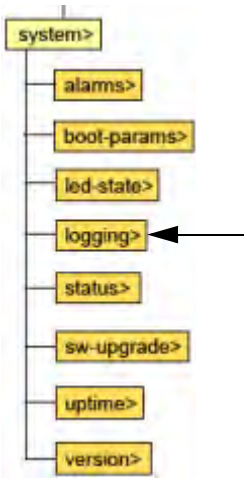


Figure D.21 System>Logging>In-Memory>Category Context Level

The table below describes the commands available at the Category context sublevel of the CLI. Access the Category context sublevel through the In-memory context level. See In-memory Context Commands on page 281.

Table D.24 Category Context Commands

Command	Description
`set level`	Sets the message logging level of the specified message category.
`show level`	Displays the message logging level of the specified message category.

set level

Sets the logging level of the specified message category stored in the system log of the Memory Array. Setting the category logging level overrides the default level set in the In-memory context command. The logging level can be set to:

- DEBUG
- INFO
- WARN
- ERROR
- FATAL

Syntax

```
set level {default | fatal | error | warn | info | debug}
```

Where:

`default`	Sets the category message level to the currently defined default level.
`fatal`	Sets the category message level to fatal.
`error`	Sets the category message level to error.
`warn`	Sets the category message level to warn.
`info`	Sets the category message level to info. This is the default value.
`debug`	Sets the category message level to debug.

show level

Displays the logging level of the specified message category stored in the system log of the Memory Array. Setting the category logging level overrides the default level set in the In-memory context command. The logging level can be set to:

- DEBUG
- INFO
- WARN
- ERROR
- FATAL

Syntax

`show level`

The command displays information similar to the following:

```
system logging in-memory category util> show level

level         warn
default-level info
```

Syslog Context Commands

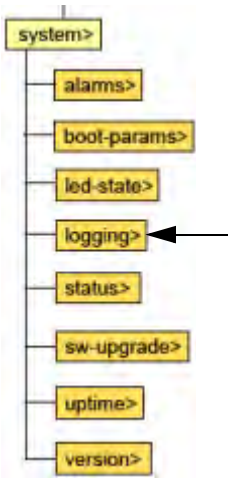


Figure D.22 System>Logging>Syslog Context Level

The table below describes the commands available at the Syslog context sublevel of the CLI. Access the Syslog context sublevel through the Logging context level. See Logging Context Commands on page 279.

Table D.25 Syslog Context Commands

Command	Description
`set host`	Sets the IP address for the syslogd host.
`set service`	Enables or disables the service that sends the system log.
`show host`	Displays the IP address for the syslogd host.
`show service`	Displays if the service that sends the system log to a host is enabled or not.

set host

Sets the IP address of the host that will receive the system log. This host must have syslogd configured correctly. The Memory Array sends messages to only one syslog server at a time. See your host's syslogd documentation for instructions. Display the man page for `syslog.conf` on your host for more information.

Syntax

`set host <ip_address>`

Where:

ip_address	Specifies the IP address of the host to which the system log messages will be sent.

Use the `save config` command to save the changes across system reboots.

set service

Enables or disables the service that sends the system log to a host running syslogd. See your host's syslogd documentation for instructions. Display the man page for `syslog.conf` on your host for more information.

Syntax

```
set service {on | off}
```

Where:

`on`	Starts the service that sends the system log messages to the host running syslogd.
`off`	Stops the service that sends the system log messages to the host running syslogd.

Use the `save system config` command to save the changes across system reboots.

show host

Displays the IP address of the host that receives the system log. This host must have the syslogd configured correctly. See your host's syslogd documentation for instructions. Display the man page for `syslog.conf` on your host for more information.

Syntax

```
show host
```

The command displays information similar to the following:

```
system logging syslog> show host

host            192.37.87.4
```

show service

Displays the status of the service that sends the system log to a host running syslogd.

Syntax

`show service`

The command displays information similar to the following:

```
system logging syslog> show service

service            on
```

Status Context Commands

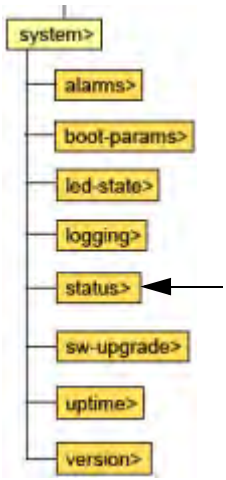


Figure D.23 System>Status Context Level

The table below describes the commands available at the Status context sublevel of the CLI. Access the Status context sublevel through the System context level. See System Context Commands on page 257.

Table D.26 Status Context Command

Command	Description
show	Displays the current status of the system software modules.

show

Displays the status of various software modules.

Syntax

show

The command displays information similar to the following when the system is operating correctly:

```
system status> show
alarm-mgr            running
data-mgr             running
diagnostics-mgr      running
hardware-mgr         running
inventory-mgr        running
raid-mgr             running
data-plane           available
raid-rebuild         inactive
vimm-config          in-spec-84-vimm
```

```
host-interfaces
    slot                port-1
    state               enabled
    protocol            pcie
    link-width          8
    neg-link-width      8
    max-data-rate       20 Gb/s
    cfg-data-rate       20 Gb/s
    host                detected

    slot                port-2
    state               disabled
    host                undetected

    slot                port-0
    state               disabled
    host                undetected
```

The command displays information similar to the following when failed VIMMs are in the system:

```
system status> show

alarm-mgr           running
data-mgr            running
diagnostics-mgr     running
hardware-mgr        running
inventory-mgr       running
raid-mgr            running
data-plane          available
raid-rebuild        inactive
vimm-config         in-spec-84-vimm
failed-vimm-ids     32, 61
host-interfaces
    slot                port-1
    state               enabled
    protocol            pcie
    link-width          8
    neg-link-width      8
    max-data-rate       20 Gb/s
    cfg-data-rate       20 Gb/s
    host                detected

    slot                port-2
    state               disabled
    host                undetected

    slot                port-0
    state               disabled
    host                undetected
```

The command displays information similar to the following when one VIMM is missing and one VIMM has failed in the system:

```
system status> show

alarm-mgr            running
data-mgr             running
diagnostics-mgr      running
hardware-mgr         running
inventory-mgr        running
raid-mgr             running
data-plane           available
raid-rebuild         inactive
vimm-config          in-spec-84-vimm
failed-vimms         32
missing-vimms        61
host-interfaces
    slot                 port-1
    state                enabled
    protocol             pcie
    link-width           8
    neg-link-width       8
    max-data-rate        20 Gb/s
    cfg-data-rate        20 Gb/s
    host                 detected

    slot                 port-2
    state                disabled
    host                 undetected

    slot                 port-0
    state                disabled
    host                 undetected
```

The command displays information similar to the following when a VIMM has been removed and the system is rebuilding the RAID group:

```
system status> show

alarm-mgr            running
data-mgr             running
diagnostics-mgr      running
hardware-mgr         running
inventory-mgr        running
raid-mgr             running
data-plane           available
raid-rebuild         active (group 15, vimm 30)
vimm-config          in-spec-84-vimm
host-interfaces
    slot                 port-1
    state                enabled
    protocol             pcie
    link-width           8
    neg-link-width       8
    max-data-rate        20 Gb/s
    cfg-data-rate        20 Gb/s
    host                 detected

    slot                 port-2
    state                disabled
    host                 undetected

    slot                 port-0
    state                disabled
    host                 undetected
```

Sw-upgrade Context Commands

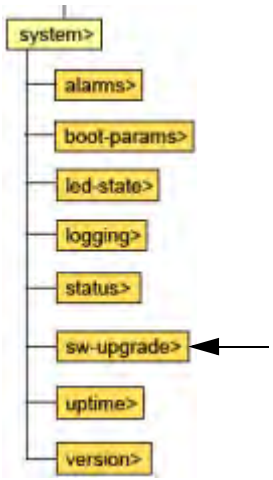


Figure D.24 System>Sw-upgrade Level

The table below describes the commands available at the Sw-upgrade context level of the CLI. Access the sw-upgrade context level through the System context level. See System Context Commands on page 257.

Table D.27 Sw-upgrade Context Commands

Command	Description
`copy system sw-upgrade`	Updates the system software factory image if you have both factory and upgrade images installed on the Memory Array and you want to make the current upgrade image the factory image.
`set active`	Sets the active partition.
`set path`	Sets the path to specify where the software upgrade files are located.
`show active`	Displays which partition will boot on the next system reboot.
`show path`	Displays the path to specify where the software upgrade files are located.

copy system sw-upgrade

Updates the system software factory image if you have both factory and upgrade images installed on the Memory Array and you want to make the current upgrade image the factory image.

Syntax

```
copy system sw-upgrade
```

set active

Sets the specified partition in flash to be activated during the next reboot of the Memory Array.

Syntax

```
set active {upgrade | factory}
```

Where:

`upgrade`	Sets the upgrade partition in flash to be activated during the next system reboot. The upgrade partition contains the downloaded upgrade software.
`factory`	Sets the factory partition in flash to be activated upon the next system reboot. The factory partition contains the factory configuration defaults.

set path

Sets the path where the upgrade software is located. After the command is run, the upgrade software is downloaded to RAM on the main board and then copied into the upgrade partition of flash.

Syntax

```
set path <path>
```

Where:

`path`	Sets the path where the upgrade software is located. A valid path format is `user@ftp://host/path/upgrade.img`.

show active

Displays the specified partition in flash to be activated during the next reboot of the Memory Array. Use this command after the `set active` command during an upgrade procedure.

Syntax

```
show active
```

The command displays information similar to the following:

```
system sw-upgrade> show active

Checking partition information ...
The active partition is set to 'factory'
```

Where:

`upgrade`	Specifies that the upgrade partition in flash is set to be activated during the next system reboot. The upgrade partition contains the downloaded upgrade software.
`factory`	Specifies that the factory partition in flash is set to be activated upon the next system reboot. The factory partition contains the factory configuration defaults.

show path

Displays the current setting for the location of the upgrade software.

Syntax

`show path`

The command displays information similar to the following:

```
system sw-upgrade> show path

Upgrade image path = 'admin@ftp://linux_host_06/upgrade.img'
```

Uptime Context Commands

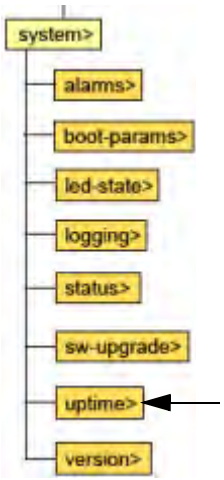


Figure D.25 System>Uptime Level

The table below describes the commands available at the Uptime context sublevel of the CLI. Access the Uptime context sublevel through the System context level.

Table D.28 Uptime Context Command

Command	Description
show	Displays how long the Memory Array has been operational.

show

Displays how long the system has been operational. The time is displayed in tenths of a second and in years, days, and hours.

Syntax

show

The command displays information similar to the following:.

```
system uptime> show

tenths-second        19097058
time                 0 years, 22 days, 02:28:25
```

Version Context Commands

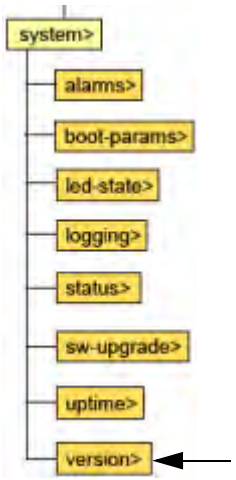


Figure D.26 System>Version Level

The table below describes the command available at the Version context sublevel of the CLI. Access the Version context sublevel through the System context level.

Table D.29 Version Context Command

Command	Description
show	Displays the versions of the software modules.

show

Displays the versions of the software modules.

Syntax

show

The command displays information similar to the following:

```
system version> show

software version:              <release>
software build date:           <date> 12:44:52
software build info:           built on swbuild.violintech.net by user common
CPL bootloader version:        <release>
OAM bootloader version:        <release>
CPL OS version:                <release>
OAM OS version:                <release>
CPL factory image version:     <release>
OAM factory image version:     <release>
upgrade image version:         (none yet downloaded)
```

```
controller version info:        12954_x8a @ 05/28/09 11:39
saxpow version info:            8418 @ 03/12/08 15:26
saxled version info:            7642 @ 01/25/08 13:48
```